ADVANCED MANAGEMENT

OCTOBER 1957
VOLUME 22 NO. 10

In This Issue . . .

Gaining Maximum Effectiveness Of Engineers And Technicians
Gavin A. Pitt

Centralized Control Of Decentralized Operations
Al N. Seares

Arbitration-Grievance Index As A Management Control
Willard A. Lewis

Capital Expenditure Analysis Procedure
David R. Platt

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Management Philosophy

A PERSON'S PHILOSOPHY of management is his attitude toward his job as a manager. Since management involves getting things done through other people, such a philosophy then is concerned with the manner in which a manager goes about getting others to work in the accomplishment of organizational objectives.

The traditional approach or attitude has often been called the autocratic approach. The autocratic manager holds authority and responsibility in himself. He delegates as little as possible, and when he does delegate he usually specifies not only what he wants done, but precisely how it is to be accomplished. In making up his mind he may seek the opinions of others, but he would consider it a sign of weakness if any final conclusion reached was not regarded entirely as his decision. He wants things done the "right way", which is his way.

If the autocratic manager is guilty of too much managing of others, there is the other extreme who manages too little. This is the weak manager who lacks the courage of his convictions. His subordinates never know what is expected of them. He may be a pleasant, likeable person, but he does not possess a sufficiently forceful personality to give leadership.

A third attitude is known as participative management, or the democratic leadership approach. The manager who practices participative management makes a point of involving others in managerial problems and decisions with which they are concerned. He wants others to feel that the conclusions reached are theirs as well as his. He delegates broadly, giving competent subordinates ample freedom of action in order to demonstrate their abilities and encourage them to learn by experience. This manager is just as accountable for results as is the autocatic manager. He feels, however, that he is able to accomplish more through other people in the long run by encouraging his subordinates to participate fully in the managerial process.

There is unquestionably a continuing trend toward the participative approach. The trend toward decentralized organization structure has accentuated this. It must be realized, however, that there is a difference between the mechanics of a decentralized organization plan and the practice of participative management. You can have one without the other. In other words, you can have a physically decentralized organization structure and then tie the managers' hands so tightly with limitations, restrictions and controls that he spends most of his time writing reports and preparing to defend or justify what he wants to do.

H. E. Lunken
S.A.M. National President

Gaining Maximum Effectiveness Of Engineers And Technicians

by Gavin A. Pitt
Vice President
Johns Hopkins University
and Hospital
Baltimore

THE ENGINEERING wonders of the world have always held a fascination for both young and old. And yet, such engineering feats as the pyramids of Egypt, the Eiffel Tower, the Brooklyn Bridge and the Empire State Building are far overshadowed by the research and engineering miracles of the past two decades. These miracles are far more significant and bode well to completely alter world economics and our own personal made of living.

To harness the atom in the first instance and then to forge it into a force for peace and economic well-being of people throughout the world, to master the principles of flight so that man can travel at more than twice the speed of sound, to construct a missile which, though far distant from its base, will heed the will of man, has required the combined skills of the scientists and engineers and the mutual assistance of education and industry. And those individuals who have served as personnel executives during these past two decades can take great pride in their contributions to this scientific revolution. A substantial amount of credit is owing those persons who have participated in the recruiting, selecting, training and handling of the human relations problems of those scientists and engineers who have made possible our modern scientific wonders.

During the last several years the public's attention has been focused on the fact that the number of college-trained engineers and scientists is far short of our current needs and that Russia is surpassing the United States in the number of persons being so trained. If it is fair to assume that a substantially higher percentage of American engineers are engaged in work related to civilian needs than is true in Russia, then Russia, which trained 62,000 engineers in 1955 to our 23,000 engineers, is substantially outpacing us in training engineers to develop military equipment, and Russia's plan to annually graduate 100,000 engineers by 1960 has an ominous significance. In this connection, one should read the report on "Engineering and Scientific Manpower in the United States, Western Europe and Soviet Russia", which was prepared by the Subcommittee on Research and Development of the Congressional Joint Committee on Atomic Energy.

A great deal is being done to correct this problem and to generate more interest in engineering and the sciences at the secondary school level as a means of increasing the number of engineering applicants to our colleges and universities. It is paradoxical, however, that over 1,500 of our high schools dropped courses in mathematics and science in 1955. On the other hand, the recent increase of contributions from American business and industry to both our engineering and liberal arts institutions is significant evidence that industry recognizes that education is increasingly important to both our national defense and our progress and that it must assist such institutions to train future generations for administrative and engineering leadership.

Although the training of an adequate number of engineers is a critical problem, there is another problem of equal importance; that is the effective utilization of our present engineering manpower.

GAVIN A. PITT was Assistant to the Dean of Brown University from 1939 to 1942 when he left the academic world to become Manager of Executive Training and Personnel Manager of the Factory Division of R. H. Macy & Company. His next job in industry was that of Administrative Director for the Hazeltine Corporation and Director of Personnel of the Hazeltine Electronics Corporation. In 1945 Mr. Pitt was named Industrial Administrator for the American Machine & Foundry Company, and remained there until 1949 when he became an Associate of Booz, Allen & Hamilton. From 1955 until his recent move (Sept. 1957) to Johns Hopkins University and Hospital, Mr. Pitt was Director of Personnel Services to General Dynamics Corporation in New York.

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The formation since World War II of more than 3,500 research laboratories employing 500,000 research workers—of whom 100,000 are scientists, together with the great increase in engineering time necessary to develop our many new products and complex devices — has made heavy inroads into our scientific manpower. It is highly significant that more than five billion dollars a year are now being expended on research in the United States. As a result, we can no longer indulge in the luxuries of the past. And yet, certain companies are still assigning PhD's in chemistry to wash test tubes for six months after receiving their doctorate. Other companies are "stock-piling" some of their PhD's, hopeful of getting a certain contract. As for engineering graduates, both Bachelors and Masters, is it any wonder that they read the display advertisements before the sports pages when they are still assigned to straight drafting work or handling simple administrative details five years after graduation from college?

Since many new products are being developed, it is a challenging period for young men with ideas, and that company which cannot challenge its engineering staff is bound to lose its engineers. When a company's top management becomes cognizant of the fact that it is losing its present engineers and is encountering difficulty in employing replacements and June graduates, then belated steps are taken to "lock the barn door". Last year the experience in one industry was that 15 engineers quit their jobs for every 100 hired. Since the cost of recruiting and training an engineer is between $5,000 and $20,000, a high rate of turnover can result in staggering costs.

Several months ago a well-known company awoke to the fact that its engineers were quitting like sailors deserting a sinking ship. Their appraisal of the problem was somewhat limited as is evidenced by the fact that they thought the problem could be rectified by a single appointment. Suggestions were sought for a personnel manager for the engineering department, a position which would start with a salary of $25,000. When inquiry was made as to the specifications for the position, the reply was, "Oh, all he has to do is hire engineers". Needless to say, at last reports the company had made no progress in meeting its basic engineering personnel problems.

What can an enlightened management do to attain the maximum effectiveness of its engineering and scientific manpower? Of necessity, the answer to this question must be tailored to the individual problems of each company, and these problems will be directly influenced by the size of the company and its product line. The following suggestions, however, may be helpful in themselves or may prompt an idea which will be useful in your own organization.

In determining what measures can be taken to attain maximum effectiveness of engineering and scientific manpower, it is appropriate to analyze some of the fundamental reasons why engineers become discontented. Recent studies have yielded some very interesting facts on this subject, and this article will serve to examine four significant problems which bear very directly on effective utilization.

First, many engineers are concerned about the organization of the engineering department. Too often a zealous section manager in the engineering department has developed an autonomous department with a complete staff of engineers, draftsmen, technicians and supporting services. Although there may be some merit in the close integration of such a staff, it has many shortcomings. One of the more serious is that when some particular phase of a project is delayed, the balance of the work force may come to a complete standstill for a considerable period of time. When this occurs, it is extremely difficult to reassign the engineers while the technical roadblock is being mastered.

TO ELIMINATE such a problem, a great many companies organize the engineering department with both a Group System and a Project System. Under such an arrangement, highly specialized engineering skills are organized on a group basis and the specialized requirements of all projects in the department assigned to the appropriate group. As a result, the ultimate responsibility for the particular development is fixed from conception through production, and the practical experience gained earlier on similar problems is extremely helpful in meeting the challenge of new applications. This is a technique which has grown out of the age of specialization, but the variety of products being engineered eliminates the hazards of repetitive boredom. When the specialized skills are less exacting, either the Project System or the Group System can be utilized.

In like manner, many companies have

found that a central drafting department is the most effective organization. A central drafting group simplifies the training of draftsmen and designers, assures adherence to the contractual requirements for engineering and results in a uniformity of drafting practice throughout the company. Similar advantages accrue to such groups as specification writing, estimating, and instruction book writing.

A department organized with a grouping of its highly specialized skills offers a great challenge to its engineers. They are stimulated by the opportunity to make a contribution to a new technical problem based on the resolution of an earlier problem. The engineers appreciate the flexibility of operation since it allows them to work on a variety of related problems rather than to specialize in one particular area or product. Failing assignment to different work, the engineer resents the fact that his professional growth is being limited. Moreover, the peaks and valleys of engineering work schedules, which are common to all autonomous engineering sections, are eliminated.

A SECOND problem relates to the utilization of non-engineering personnel. In a recent informal poll which was held among 800 personnel executives, more than half of the group indicated at least one-third of the work being done by engineers in their companies, could be handled by other personnel. Although progress has been made in some of the larger companies in assigning engineering aides and technicians to relieve engineers of routine duties, engineers complain that there is still substantial room for improvement. Since time pressures on an engineering manager are so great, it is often easier for him to maintain the present workload system. However, those companies which have made the greatest strides in effectively utilizing their engineering manpower have conducted analyses of the engineers' workloads to determine which functions might best be assigned to technicians or engineering aides. This is an area wherein personnel officers with a knowledge of job analysis could make a real contribution.

The poll referred to above points up a challenging opportunity for personnel executives. It is quite understandable that the Director of Engineering may want to employ 100 new engineering graduates in June and does not want to be saddled with a large group of non-engineers. On the other hand, there can be no argument with the statement that this country is faced with serious engineering shortages for at least five years. Already we know that there will be more competition for the graduate engineer in 1957 than was true last year, and this trend will continue as industry seeks to meet growing civilian and defense requirements.

It is difficult to suggest an adequate ratio of engineers to non-engineering or support personnel without studying a company's situation. It is of interest, however, that several studies have revealed the fact that 3 to 6 times as many draftsmen, inspectors, laboratory technicians and supervisors are needed as engineers and industrial managers. Studies have indicated, for example, that a ratio of 2½ to 3 engineers to 1 support person is valid on research and development projects.

While I propose a greater utilization of technicians, I do so with full knowledge of the fact that last June there were only 14,000 graduates of our 2 year technical institutes. Industry could utilize two or three fold that number. Intelligence reports from Russia indicate that its two year technical institutes have enrollments of 1¼ million students. The dearth of technical institute graduates in America highlights the opportunity for two-year community colleges to offer courses and programs for the training of technicians. In this connection, local industry should be prepared to assist such institutions by making both money and teaching staff available to support such programs. I would like to offer a final suggestion concerning technicians and assistants. Some companies which have pioneered in this area have reservations because they have found that the engineer spends all of his time training his assistants. Recognizing such a possibility, the Training Department could make a real contribution if it were to develop a program of instruction for engineers designed to facilitate the training and handling of their assistants.

A third problem that affects proper utilization of engineers is generated by a company's salary schedule. Too often in the past a company has set an arbitrary ceiling on an engineer's salary range predicated on the thought that, unless an engineer is carrying administrative responsibility, he does not warrant more compensation. As a result, some of the most creative engineers have been promoted to managerial positions.

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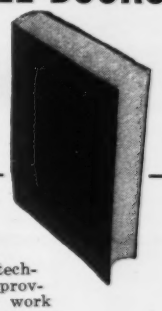

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The engineer has thereby qualified for more compensation, but the company may well have lost the creative genius of that man. And incidentally, unless he has the ability to serve as a leader and to handle human relations problems, management may later greatly regret his appointment.

Several well-known corporations have resolved this problem by developing compensation plans which offer the same salary range to a man engaged in pure research or engineering as to the engineer assigned to administrative work. This is a sound approach to the problem since it recognizes the varying capacities and abilities of its engineers and encourages the assignment of an engineer to that type of work wherein he will be most effective.

A fourth area of effective utilization is related to an engineer's desire and need for additional engineering studies. Many engineers, recognizing the professional nature of their training, are desirous of taking advanced studies for credit towards a degree or because of interest in a certain subject. Those companies are fortunate which have such facilities close at hand. Cooperative programs and evening courses have been developed with great success. For example, in 1955 a group of twenty-three aircraft companies reported that 13,650 employees participated in such programs at a cost of more than $450,000.

Our colleges and universities are anxious to be of service, as is evidenced by the action of Rensselaer Polytechnic Institute which, under President Houston's dynamic leadership responded to the needs of the industrial community of Hartford and opened a branch 250 miles from the campus at Troy, New York. Turning to the west coast, the Board of Regents of the University of California has just approved the establishment of a graduate school in the San Diego area as an outgrowth of a request which originated with civic and industrial organizations in that community. It has been estimated that a physical facility costing from $12 to 15 million dollars will be erected. Such a school, located in Southern California, will attract outstanding engineers and scientists to its faculty and will offer a tremendous opportunity to engineers in the San Diego area who are interested in pursuing graduate studies in scientific and technological fields. Higher education is anxious to be of service to the community and the nation. It remains to American business and industry to suggest the ways and provide the means to develop a worthwhile program. And industry is responding. For example, the aircraft companies mentioned earlier granted $480,000 for college scholarships and an additional $1,125,000 for graduate fellowships in 1955-56. It is highly significant that Russia, with a keen appreciation of the importance of engineering training, is expending 1/7th of its national budget on education.

In conclusion, I believe that one of the most challenging phases of human relations work during the next decade will center about the engineer. There is opportunity for much basic research in the motivations and objectives of an engineer who, though he has been trained as a professional man, must be assimilated into the activity of a group. It is shocking to note that, in a recent survey of engineers, 76% felt that management did not recognize the engineer as a professional. Even more astounding was the finding that 78% of the group surveyed felt that they were of no importance to their company.

THE National Society of Professional Engineers has made a real contribution to the enhancement of the status of the engineer in its preparation of "Criteria for Professional Employment of Engineers". These criteria were prepared on the fundamental premise "that engineers are professionals based on educational background, the intellectual and non-standardized flavor of the work, the relationship between engineers and employers, as well as the necessity for adhering to ethical precepts." The basic principles which served as a guide in the formulation of the Criteria included the following concepts:

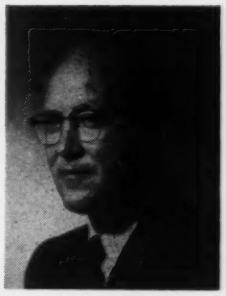
"1. The only satisfactory method of dealing with engineer-employer relationships is on a comparative common-interest basis.
2. The engineer shares an equal responsibility with the employer in elevating his professional status.
3. Management should regard the engineer as one who is identified with the "management team", whether the engineer is in a supervisory or non-supervisory position.
4. The engineer must be "company-minded" and think in terms of the company's problems and growth as well as his own."

These principles are divergent with the idea of some well-meaning engineers who have felt that the professional status

of the engineer could be attained through unionization. The problems, however, are human relations problems and cannot be resolved by a union contract.

Inasmuch as this problem is equally as important as management development, it is proposed that consideration be given to the creation of a post to be known as Director of Engineering Development reporting to the company's Vice President who is responsible for this function. This Director should be well-versed in social psychology and individual and group motivations and should be qualified to organize and direct personnel research in uncharted areas. In the case of a multi-division organization, a Manager of Engineering Development should be set up in each division. Although he should report to his division's Director of Engineering, he should counsel closely with the Director of Engineering Development at corporate headquarters. Through research, study and continuous counsel with the engineers, the Director of Engineering Development would be able to make a significant contribution to the professional development and utilization of our present engineers and thereby assure an adequate staff of scientific personnel for the crucial years that lie ahead. ■

Winner of S.A.M.'s 1957 Material Handling Award



James R. Bright

The Society for Advancement of Management's former Vice President of Material Handling, **R. W. Puder** of the E. I. du pont de Nemours & Company, has announced the winner of the 1957 S.A.M. Material Handling Award as **James R. Bright**, Associate Professor of Business Administration at Harvard University. The award will be presented to Mr. Bright at the Society's Fall 1957 Measurement of Management Conference, in New York, by the current S.A.M. Vice President of Material Handling, **Warren J. King**, Associate Editor, McGraw Hill Publishing Company.

1. As chief editor of *Modern Materials Handling* (1950-54), Mr. Bright changed the emphasis in that magazine from descriptive to analytical approaches to Material Handling, giving the field a new impetus toward a more scientific approach.

2. When invited to deliver the James Clayton Lecture in England in 1953, by the Institution of Mechanical Engineers, Mr. Bright directed his paper toward a review of American Material Handling practice, summing up significant trends in the field with such brilliance that the paper was reprinted all over the world.

3. In 1954 Mr. Bright left his editorial job on *Modern Materials Handling* to devote all his time to the development of a program for the Annual Material Handling Training Conferences at Lake Placid, because of his belief that Industry needed a sound and intensive training course of this type. The many business firms in the United States, England, Mexico, Canada, Switzerland, Holland and France which have supported the Lake Placid Conferences each year since have borne out that contention.

4. Because the 2-year study he has made on *The Impact of Automation on Management*, which will be published soon by the Bureau of Business Research at Harvard, includes an historical study on the origin of material handling equipment —designed to preserve some of the background before it is lost by the passing on of originators of equipment.

5. For the work he is currently doing for The John Wiley Company, as Editor-in-Chief of a series of Material Handling books designed to contribute highly worthwhile material on the industrial level. The first of this series will be "*Marine Cargo Operations*" by Sauerbier.

6. And, of course, for the many articles on the subject of Material Handling which Mr. Bright has written. ■

articipants in the presentation of the 110th S.A.M. University Chapter at Xavier University in incinnati, were (L to R) **Edward Alf**, President; **Prof. J. F. Martin**, Faculty Advisor; **Prof. Harold scher**, Vice President, University Chapter Division, and **Walter Hahenzahl**, Senior Chapter Advisor.

110th University Chapter Charter Presented

THE S.A.M. University Division continues to move forward with the presentation of the charter to the 100th chapter at Xavier University, Cincinnati, Ohio.

Since the installation of this chapter the 111th chapter was established at the State College of Washington, Pullman, Washington. Initial steps were taken in September to organize new chapters in the Colleges of Business Administration at the University of Tulsa, Oklahoma, and at the University of Georgia, Athens, Georgia.

More chapters are on the way as the University Division continues to expand its service to education, industry, and the community.

Centralized Control Of Decentralized Operations

By Al N. Seares
Vice President
Remington Rand Division
Sperry Rand Corporation
New York

THE "MAKE UP" of this idea stems from the exciting and challenging post-war years, which have brought unparalled economic growth. Dynamic Expansion has been keyed to amazing technological progress on all fronts and, apparently, continued momentum is assured for the next forty years—if we can integrate a fact-powered communication system to decision making management.

First, let's take stock of recent economic or business events, as they might provide "bench marks" to project our administrative planning in keeping with constantly enlarging management responsibilities

Certainly, it is obvious that the current wave of mergers, supplemented by diversification and decentralization, is presenting a multitude of new management problems. While some organizations are proceeding to decentralize their facilities on a somewhat autonomous basis, others are reversing themselves with the centralized control of all factual data regarding the current utilization of facilities, and related resources; particularly the productivity status of working capital.

This trend has another challenging aspect in that may organizations are at the same time recognizing the need for "product group" specialization from research through production and marketing, thereby increasing the number of operating units within the framework of a single business.

The execution of management policies must, therefore, be supplemented with a supporting *two-way data communications* network that reports "variance conditions" from acceptable norms within short range — intermediate — and long range operating objectives.

Which prompts me to quote a story a friend told me recently—that is somewhat analogous to this centralized management problem:

"There was a dachshund once—too long it hadn't any notion—how long it took to notify its tail of its emotion —and so it happened when its eyes were filled with tears and sadness— its little tail went wagging on—because of previous gladness."

In this respect, have you ever thought about the efficiency of the human being —of how a healthy mind and body, operating through a constantly "tuned in" nervous system, maintains stability under almost all circumstances? From our internal organs—to the extremities of our body aches and pains are instantly signaled to the brain for diagnosis, and for suggested corrective action.

Visionary? Yes, but somehow business must approximate the functional efficiency of the human being in maintaining a "statistical intelligence" system that quickly reports all out of balance operating conditions, from predetermined norms in order of magnitude.

On the theory that "A problem well defined is half solved" lets review developments leading up to the immediate problem. This means considering its origin, its frame of reference, its nature, and its dimensions. For all practical purposes, this problem of Centralized Control of Decentralized Operations has become acute within recent years.

The seed of the problem was planted about two long lifespans ago, when Eli

AL N. SEARES, currently Vice President of Distribution and a Member of the Editorial Committee for the Society for Advancement of Management, has long been an advocate of organizations devoted to the advancement of good management. He has served the National Sales Executives as a Member of the Executive Committee and a Past Chairman of the Board. He has also written several books on the subject of good management, two of them being "Graphic Controls For Sales Management" and "Personnel Administration—Records and Routines."

Whitney invented the notion of manufacturing products by assembling interchangeable parts. Without that concept, and its instrumentation through machine tools—and the inspection techniques that make quality control a reality—we could not have mass production and the enormous variety of high quality and low priced necessities that today provide our high standards of living. Nor would we have the subsequent problem of Centralized Control of Decentralized Operations.

The problem certainly did not exist when practically all manufacturing was done by shopkeepers who largely made what they sold, and then sold what they made under one roof. The merchant-craftsman could observe what his journeyman and his apprentice did. He could know his customers personally, and deal with them face to face. The introduction of inter-changeable parts has changed all that. The change, like all changes of this sort, started slowly at first and has gone on faster and faster. It obeys the same law of growth that controls all such processes. That is a very simple law. It is so simple that it is deceptive, almost frightening. The law of growth is that the increment of growth is proportionate to the size of the growing thing. The rate is the all important thing.

WHAT is actually happening and at an increasing pace is this: We are necessarily increasing both the number of people we employ and the degree of their specialization. As we increase the number of people, we have to increase the number of supervisors. If we are concerned only with "line people" doing essentially the same kinds of work, *we can maintain the "span of control" simply by bringing in new layers of supervisors.*

For example, in a sales organization we can have a sales supervisor for each twelve salesmen; an Assistant Branch Manager for each five supervisors; a Branch Manager for the five assistants; and so on up to a Vice President in charge of Marketing, etc. If we do this, we preserve the "span of control". But we play havoc with communications up and down the line, and breed a serious problem of administrative control. We can also abandon a reasonable "span of control" by not creating the intervening layers as often as span theory and experience indicate we should. In which case we preserve direct communication, but create waiting lines and inefficiencies through inability of executives to make decisions promptly. This, too, breeds a serious administrative control problem.

In real life, however, we have not only the control problems arising out of increased numbers of line people doing like jobs, but also the problems arising out of increasing job specialization in both line and staff work. A generation or two ago we had no such staff departments as Market Research, Operations Research, Quality Control, Psychological Testing, Sales Training, and the like. Now they are becoming increasingly common and increasingly important adjuncts to management. They are necessary because business is becoming more complex and its parts more interlocked. But these departments themselves create new interlocks among themselves, between themselves, and the line operating departments with whose operations they are concerned. They are essential because they provide necessary information not otherwise available for the increasingly complex problems of administration in an economy that is a mixture of free enterprise and state interventionism. Yet, they create a difficult administrative problem not only because they increase the number of factors with which senior management must deal, but also because they are staffed with technicians who are trained in methods and disciplines unfamiliar to most executives, and who are not trained in matters and methods that are ingrained in executives. Hence, there is a difficult communications problem between staff and line that adds complexity to the already complex communications and control problem confronting management of all large operations.

No man can be criticized for not knowing what he has had no chance to learn. Neither can a man master all the skills and disciplines that a modern corporation must use. Yet management men must face up to this problem—*It must somehow assume responsibility for coordinating the work of many specialists with divergent knowledge and interests, to produce the predetermined result approximating its objectives.* As I see it, the task of management is to plan, decide, delegate, and control. The function of staff is to analyze, relate, and report. The job of operations is to execute, observe, and record. It is not the duty of management to master the technical methods of either line or staff. The day is now past when a senior executive should claim—let alone boast—that he can do any job that needs doing. There is a proverb that "A man who is his own lawyer has a fool for a client." By extension, the senior executive who is his own controller, his own chief engineer, his own sales manager, his own production manager and his own staff advisor on finance, production, and marketing—that man is a sadly confused and self-deluded jack-of-all-trades.

THE MODERN management executive must not strive for mastery of all the techniques used by the specialists he employs. What he must do increasingly well is to understand the powers and limitations of methods and disciplines so that he can ask the right questions of the right people to get the information he really needs; to decide wisely, delegate skillfully, and control effectively. This is a large order. It therefore seems to me that the modern management man who intends effectively to maintain Centralized Control of a Decentralized Operation must do two things. *First, he must have the ability and training to think in terms of facts and figures, remembering that his instruments are people and people have human nature and human reactions that are far from rational. Secondly, he must learn to know when to believe whom, and how much.*

Certainly he must think in terms of facts and figures, *because all progress begins with measurement.* However, "greater than", "equal to", and "less than" are as truly measurements as figures are, though they are less exact. Failure to keep that in mind leads executives astray. For example, the statement that the probility of something is one half does not mean that if you do that something twice you are certain to succeed once. It means that if you decide to do it, you had better be ready with a program to pick up the pieces because, as likely as not, it will blow up in your face. Many statements made to management men by staff specialists are put in the form of numerical values. To the specialist, they mean one thing. *To the management man who has not learned to think in facts and figures, they can mean something quite different and lead him to a bad decision.*

For example, the probability of rolling a seven with two dice is greater than the probability of rolling any other combination. It is one-sixth. It is this fact, and not the fact that the probability of rolling a ten is only one in twelve or a nine only one in nine, that makes betting against the dice almost as safe

as running an insurance company. There is risk in all business. There is chance in all business. The probability figures of specialists must be translated by management men into statements of "greater than", "equal to", or "less than", and evaluated on that basis and not accepted as predictions. They are not predictions, and to the men who furnish them they are not meant to be predictions. That is what I meant when I said a moment ago that management men must understand the powers and limitations of staff and operating men's methods, and the reasons they must be able to think in facts and figures.

THAT brings us to the second point: that a management man must know when to believe whom, how much. With the exception of a small minority of knaves, people usually are honest in most things. However, except in top management they see only a small part of the total picture, and they both ride their hobbies and prejudices, tending to overestimate the importance of their special knowledge. That is why management is constantly confronted with a problem of reconciling conflicting statements and differing points of view. Part of this is a communications problem, owing to the failure of management to make its wants and needs understood clearly, and of the staff and operating specialists failing to feed back explicitly what to them is implicit in what they say. Much of it, however, is inherent in the master-servant relationship, and in human rivalries jockeying for the favor of the boss.

The first problem, then, in exercising Centralized Control of Decentralized Operations is that of reconciling the problem of communications, and feedbacks to the problem of maintaining a workable "span of control". The compromise is not easy, but it is essential. The presence of many levels of supervision provides manageable spans of control, and its price is some distortion in the communications system. In contrast, the absence of some levels of supervision may at times tend to simplify the communication systems. But it exacts its price in waiting lines, loose ends, and loss of control of operations. A solution may be found in the common language translation concept from one frame of data reference to another. For example, we need people who have a knack for fluent expression orrally and in writing, combined with say, a sound knowledge of mathematics, physics, chemistry, economics, marketing, and accounting. As individuals, they probably would not be good at anything, but they could listen to a Sales Manager talk about his field organization problems, of warehouse and sales force locations, and tell a market research man what data are required, and a mathematician what equations to set up and solve. Then they could take the mathematician's results back directly or indirectly with the advice of the market research man to the sales manager in the language of sales management. This notion is not fanciful. In a very limited way it is being done now, and it seems to be a practical way of breaking down the communications barriers between specialists who know their own disciplines thoroughly but who lack acquaintance with others. In some fashion, the communications and "span of control" problems must be solved or at least compromised.

The first obligation of management is to use the resources it can command—in men, money, materials, and facilities—to earn enough profit and to insure its ability to raise fresh money for future needs on favorable terms. The corporation that does not show satisfactory earnings cannot keep pace with its competition. In the long run, it will fail to serve the needs of its customers, and it will eventually lose them. The result is loss to the economy as a whole, to the communities in which its plants are located, to its employees, and to its stockholders. No corporation can earn satisfactory profits indefinitely, unless it has good control of all its operations. Avoidable wastes of resources are becoming luxuries that no management can long afford. We all hear and read much about the growth of population creating new needs, and guaranteeing new and growing markets that will indefinitely assure a prosperous economy.

That notion seems to me too easy, too facile. If new mouths to feed are the key to prosperity, then why are not India, China, Indonesia and other countries that have much larger rates of population growth much more prosperous than the United States, West Germany, and Canada? It seems to me that we must at least consider the possibility that we may be faced with the problem of supporting an increasing population that is either too young to work or too old to find jobs. If that should become the case—and if we are also faced with rigidities and restrictions on hours, wages output per manhour, and a continuing infiation o tfhe money supply and of hourly wage rates—there is some risk that per capita production may fall and carry real wages and the standard of living down with it.

To work effectively as we can, we must re-define our objectives and develop new formulae for management. In spite of artificial difficulties and restrictions—we must still seek to maximize profit because the only way management can appraise the quality of its performance is by reading its profit and loss statement. A high return on invested capital—and a high ratio before tax profit to sales—indicates that we are serving many customers well. Low profits indicate that either we have lost control of our cost structure or that we are mistaking the real needs of our prospects, or both.

THAT is why records and records administration are increasingly important tools and tasks of management. If we think of a business as a corporate person—which is what it is legally—then we can look upon records as being the content of the memory cells of the corporate brain, and upon records administration as the counterpart to the sympathetic and central nervous systems. A low organism can get by with only a sympathetic nervous system that guards it from gross dangers, and adjusts more or less to changes in its environment. In like fashion, mom-and-pop stores and the craftsmen-merchants of a century ago could get along with very simple records; about all they had to know is what prices they could charge and what costs they could assume to produce a profit and maintain a comfortable volume. As a business grows in size and complexity, it must increase the size and complexity of its central nervous system—and at a much more rapid pace than its size. Otherwise, it will find itself in the same position as the dinosaur—all meat and no brains. Not having the necessary equipment to warn it of changes and dangers the dinosaur was easy prey for the brainier and more nervous evolving mammals. Businesses that lag behind in the efficient development and control of records cannot see and then act quickly enough to adjust to market and production changes. They, too, will be meat for smarter competitors with highly developed facilities for getting and using action-facts.

To come to the point, in a Control System For Decentralized Operations—because "Nothing happens until somebody sells something" — we have to

start with our prospects and customers. This means that we must begin with market research data. There seem to be four indispendable types: sales forecasts, territorial market measurements, analysis and control of sales department activities, and continuous field audits of competition and customer behavior. I am as well aware as you are that sales forecasting is difficult. This is because it assumes that we can assay in advance the changing whims, opinions, prejudices, and value judgments of a changing parade of changing individuals. It can even be self-defeating because the minute we have a forecast we act to changes it more to our liking. Yet we must forecast because we must have some sort of expectation about what we can sell in order to plan what we shall produce. In practice, we can make pretty good forecasts that do work out; we can do this and get away with it because we are working with large numbers and slowly changing probabilities, as an insurance company does when it calculates its expectancies and rates.

Territorial market measurements are a comparatively new thing that have been developed in the past ten years. Essentially, they are estimates based on computations that are now practical, thanks to the development of high speed electronic data processing equipment, to produce adequate Fact-Power as a management aid to further an inbalance position between "mass production" and "mass consumption".

TO ASSURE sales production in keeping with marketing possibilities, sales management must, of necessity, provide itself with factual data that measures the location, character, depth, breadth, and frequency of every profitable sales opportunity. Such marketing data will vary by kind of business and, likewise, even the correlation values of multiple measurement factors.

Misdirected selling effort and related unprofitable expenditures in the distribution process neither reflect credit to sales management nor provide a satisfactory "value added" service to the purchaser.

The application, then, of any of the principles of Scientific Management that permit the measurement of "sales input" possibilities is a fundamental requirement to the success of any business in a dynamic economy.

Such "sales input" measurement is, likewise, a continuous undertaking, indicating other factors as to the "sales output" required in the educational, communications process—while at the same time providing up-to-date "feed back" data for variance analysis for selective management by exception action.

The overall objective results of such Market Measurement data provides the following profitable returns to sales management:

1. To establish quotas that are not open to question for the territories assigned to salesmen, distributors, branches, districts, or other subdivisions of a sales organization;
2. To determine sales manpower requirements and needed number of agents, dealers, or other outlets to provide adequate, but not wasteful coverage of each territorial market;
3. To determine the proper number and boundaries of sales territories; also if both direct and agency channels of distribution are used to assure most efficient pattern of distribution for each product line in each territorial unit;
4. To compare the performance of each branch, district office, salesman, agent or distributor with its or his "readily salable" market and thus make strictly objective appraisals of performance;
5. To concentrate management attention on strong spots in the sales and distribution operation in order to define what should be done in other territorial markets and on weak spots in order to institute corrective action;
6. To allocate budgeted appropriations for distribution activities in proportion to market opportunities;
7. To check that the advertising and promotional media are delivering salesmaking messages where they are the most productive;
8. To develop short range intermediate and long range marketing data for use by management in projecting financial and manufacturing requirements in keeping with growth trends;
9. To determine variance of sales to normal sales expectancy by marketing area;
10. To permit realistic Sales Forecast and Sales Budget Forecast that assures the maximum utilization of operating facilities and invested resources with inbalance sales results to profitable, production scheduling, and inventory turnover.

The need for sales control and analysis of sales department activities is so apparent that I need not dwell upon it. It is the effective means of defining profitable customers' characteristics, of pre-selecting worth while prospects, of directing salesmen to genuine sales opportunities, of controlling their use of time and effort, and of insuring that sales support, promotion, advertising, merchandising and the like, is coordinated effectively with field selling effort.

These three kinds of necessary records and data processing are primarily quantitative, and based on easily ascertainable facts and relationships. We can get some from external sources such as Census data, data on business activities that relate to our own business, and advertising and sales promotion department records. Organized in workable form, such "Statistical Intelligence" tells us about how much we can expect to sell where, with what amount of cost and effort.

CONTINUOUS field audits and special one-time motivation surveys are different. They are intended to deal with what goes on in the minds of buyers and prospects, with value judgments.

Such data can be used in designing both products and sales plans and programs. Then their execution can be controlled through the other kinds of market records—sales forecasts, territorial market measurements, and sales control and analysis of sales department operations. The management that lacks such records is at a serious disadvantage compared to competitors who have them. They are no longer, for most companies optional. They have become essential to the effective Control of a Decentralized Sales Operation. As new production capacity goes on stream—and as more goods are offered to consumers—the need for such control over the elements of distribution will surely increase.

The "Value Added by Distribution" is as great a contribution to satisfying needs as the "Value Added by Manufacturing". Long strides have been taken by manufacturing executives to reduce costs and improve quality in production. Now, comparable steps can be taken to reduce the costs of distribution, thereby increasing the productivity of the distribution function. They are made possible by new methods of dealing with the data about markets and sales to disclose relationships statistically. Sales executives no longer need run their operations on hunches and impressions. New types of records and new data processing methods can produce—and are produc-

ing—Fact-Power as realistic and as useful as time study, and quality control produce for manufacturing men.

ONCE *the sale is consummated and reduced to a sales order, the possibilities of centralized control to integrate and streamline and automate operations are enormous. The writing of the sales order is the act that sets a host of records in operation to trigger decisions and impel actions. It immediately disburses or reserves inventory, and the inventory control records come into play. The inventory reduction signals necessary action by production planning and production control, where other records provide the basis for actions. Materials are used, and so purchasing records are activated as orders are released to vendors. Branching along another line, quality control, labor, cost accounting, and maintenance records are called on for action-facts and decision-facts necessary to intelligently integrate the control of manufacturing operations. And in the controller's department along with cost accounting records the accounts receivable, accounts payable, payroll, and many other records all reflect the various events that are touched off by the writing of the sales order. Indeed, every record of the business almost exists to show some aspect of action that starts internally with the sales order and externally with a salesman making a well timed and well directed call on a prospect who is ready, able, and willing to avail himself of a proferred user-benefit. In other terms this is being expressed as "one shot"—automated data processing or integrated data processing through common language, etc.* A while ago I spoke of records being akin to the nervous system. As we all know, we have two independent nervous systems. One is the automatic or sympathetic nervous system that deals with routine matters without any attention on our part. It takes care of such jobs as keeping our body temperature within close limits—of regulating the speed of our hearts and the rate of breathing—and doing many other chores that add up to running our metabolism. Taken individually, these are small repetitive routine jobs. In the aggregate, however, they are the jobs upon which life depends.

The business counterpart of this automatic nervous system are the routine records that are often maintained and always used in the operating departments—the sales order register, the purchasing record, the inventory and production records, and the like. Often such records are best maintained manually by clerks at the point of use. Many very efficient types of equipment and manual systems have been created for such applications. Frequently, a properly signalled visible control system will provide the most economical, efficient, accurate, and rapid control required. Properly integrated with supporting mechanized devices such as desks, calculators, typewriters bookkeeping machines, and punch card equipment—with perforated tape for input or output—such a combination can rapidly provide Fact-Power for each unit of management, with sizable savings.

It is, therefore, a mistake to think that electronic data processing equipment has outmoded or eliminated these other related functional devices. That mistake is the same as the mistake of thinking that the cerebrum has made the primitive medulla and old cerebellum superfluous. Those ancient organs are still taking care of the business of routine living and doing a better job than we could possibly do if we had consciously to program each heartbeat and each step.

The business counterpart of the central nervous system which in man deals with conscious activities — reasoning, planning, and executing puposeful complex actions—is the highly sophisticated, integrated data processing equipment and techniques that have recently been developed. These are the things that are giving us the power to deal with the increasing complexities of Centralized Control of Decentralized Operations. It is perfectly true, of course, that there are companies that can keep a UNIVAC System, or other high speed, large scale digital computer, loaded with some intrinsically simple job such as payroll, public utility billing, or premium accounting—and save a lot of money.

The real utility and the great value of these Electronic Data Processing Systems lies in their combination of great versatility and incredible speeds. This combination of speed and versatility opens a whole new area of control. A single datum which can be anything from a single character to several computer words in length, can be written once on magnetic tape. It can then be handled again and again—added, subtracted, multiplied, divided, compared, merged, abstracted or modified—for many purposes. Let us consider again a sales order. It can be given a numeric customer designation for convenience and brevity. Then, *with proper programming*, it can be used to all the things that have to be done with it in the ordinary course of business, such as filling it, shipping it, billing it, and handling the payment for it. It can also be distributed line by line to reduce inventory, to set in motion a new production order, to explode a bill of material, and to furnish data that eventually will lead to releases of purchase orders and creation of accounts payable. With a computer properly *programmed* all these things become automatic.

I have used the word "*programming*" several times and an explanation is in order. This is a technique in instructing an Electronic Data Processing System so as to maximize its productive possibilities. In many respects, programming might be considered a method of "work simplification" and/or "work measurement" to assure the attainment of the most desirable operating objectives. In many cases the programming of a computer application has revealed "unusual" work simplification possibilities previously overlooked and that could be incorporated in the present system.

ELECTRONIC Data Automation Systems provide what amount to new instruments of control, for they are foolproof and automatic. Aside from putting tapes on and taking them off the servo-mechanisms of the computer they require practically no human intervention to give people action-facts. If the computer is properly scheduled and programmed, all the information needed comes quickly, and accurately, to the people who need it to control detailed operations. If such factual data is then used to prevent overstocks, understocks, broken delivery promises, materials shortages, past due receivables, failures to discount payables, and the like, management does not have to devote time to correcting mistakes that should not have occurred but that do happen.

This is a very elementary gain from the use of Electronic Data Processing Equipment. It is only one step in the multiple use of input data, instead of the repeated single use of significant data, department by department, plant by plant, with final consolidation in a corporate statement. This gain results from two factors: (1) electronic circuits are vastly faster than human nervous systems and (2) the gates in these cor-

cuits work when they are told to do so, whereas human synapses are undependable. There is no question that when there is enough volume of simple data it pays to use electronic data processing equipment for either single purpose or related multiple purpose repetitive jobs. Efficient control means using appropriate instrumentation for each job to be done, with the free flow of information and feedbacks among related jobs. Total net cost and time availability determine what is best.

Experience indicates that electronic data processing equipment has created new powers of Control of Decentralized Operations. What it has really made possible is the analysis of meaningful relationships in detail. Here is a concrete example. Efficient sales managers for many years have maintained visible sales control records with signal control. These records included either all accounts or all accounts and prospects. Such vital administrative records were, are and will continue to be extremely valuable for the control and field supervision of day to day activities of salesmen. Conscientious and figure-minded sales managers tried to analyze such records, recognizing that such analysis is useful.

SUCH attempts were usually successful with respect to individual accounts and, in a limited degree, with individual salesmen. They broke down completely when the attempt was made to extract important relationships among numerous independent variables — size of establishment, industrial classification, products produced, pattern of calls, pattern of promotion, location, strengths and weaknesses of covering salesman, and the like.

Electronic data processing equipment has changed this situation. Now the same data used to feed the visible sales control record — invoices, call reports, lost order reports, basic situation reports, direct mail release reports, etc.,— are fed into the circuitry of a computer where they produce the posting medium for the sales control record (plus data for many other purposes). Then, accumulating on tape for a significant period, they can be used for statistical analysis that shows clearly such important, and hitherto virtually unavailable information as:

. Characteristics of profitable accounts;
. Stigmata of unprofitable accounts;
. Potential worth of prospects, when and if sold;
4. Efficient call patterns for converting prospects;
5. Efficient call patterns for retaining profitable accounts;
6. Strengths and weaknesses of individual salesmen;
7. Penetration of market segments as a function of effort; and
8. Saturation and retention of accounts.

With a comprehensive analysis that covers these and related areas plus the fruits of territorial market measurements that now take hours instead of weeks for arithmetical calculations, plus reliable sales forecasts; plus other market research information—a sales manager does not have to be a wizard to know, and know that he knows how many salesmen he needs, where he needs them, how many of what kinds of prospects and customers they should cultivate, how often they should call, and what strategy and tactics they should use. What is more, he knows from his up-to-date visible sales control system—accurately and currently, thanks to electronic data processing of daily reports—how much progress is being made in relation to opportunity, so that through his supervisors he can take corrective action where and when it is needed.

Old and familiar methods of statistical analysis now become practical. The thousands and hundreds of thousands of individual calculations necessary in a large scale multiple regression analysis, for example, were just too time-consuming to make such analysis anything but a toy suitable for dealing with small quantities of data. Now multiple regression and linear programming is a practical method of analysis and prediction. Other forms of probability analysis either have been, or can be, programmed for electronic data processing equipment.

UNTIL a few years ago, the calculus of probability was an intellectual exercise for professional mathematicians, and linear and quadratic programming and other analytical techniques outside the orbit of statistics were just words. Now, both advanced statistical analysis and operations research are practical control tools of great usefulness in centralized and decentralized large scale operations. This transformation has come about because the speed and versatility of electronic data processing equipment makes it possible to run a large quantity of data through complex data reduction processes, and once the programming and bugshooting are out of the way, to obtain measurements, estimates and predictions. All phases of business that can be described in numeric term can now be studied through the use of appropriate models—based on logical and economic assumptions and data from experience. Thus, management on the basis of measurement which is the beginning of progress becomes possible.

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ing—Fact-Power as realistic and as useful as time study, and quality control produce for manufacturing men.

ONCE *the sale is consummated and reduced to a sales order, the possibilities of centralized control to integrate and streamline and automate operations are enormous. The writing of the sales order is the act that sets a host of records in operation to trigger decisions and impel actions. It immediately disburses or reserves inventory, and the inventory control records come into play. The inventory reduction signals necessary action by production planning and production control, where other records provide the basis for actions. Materials are used, and so purchasing records are activated as orders are released to vendors. Branching along another line, quality control, labor, cost accounting, and maintenance records are called on for action-facts and decision-facts necessary to intelligently integrate the control of manufacturing operations. And in the controller's department along with cost accounting records the accounts receivable, accounts payable, payroll, and many other records all reflect the various events that are touched off by the writing of the sales order. Indeed, every record of the business almost exists to show some aspect of action that starts internally with the sales order and externally with a salesman making a well timed and well directed call on a prospect who is ready, able, and willing to avail himself of a proferred user-benefit. In other terms this is being expressed as "one shot"—automated data processing or integrated data processing through common language, etc.* A while ago I spoke of records being akin to the nervous system. As we all know, we have two independent nervous systems. One is the automatic or sympathetic nervous system that deals with routine matters without any attention on our part. It takes care of such jobs as keeping our body temperature within close limits—of regulating the speed of our hearts and the rate of breathing—and doing many other chores that add up to running our metabolism. Taken individually, these are small repetitive routine jobs. In the aggregate, however, they are the jobs upon which life depends.

The business counterpart of this automatic nervous system are the routine records that are often maintained and always used in the operating departments—the sales order register, the purchasing record, the inventory and production records, and the like. Often such records are best maintained manually by clerks at the point of use. Many very efficient types of equipment and manual systems have been created for such applications. Frequently, a properly signalled visible control system will provide the most economical, efficient, accurate, and rapid control required. Properly integrated with supporting mechanized devices such as desks, calculators, typewriters bookkeeping machines, and punch card equipment—with perforated tape for input or output—such a combination can rapidly provide Fact-Power for each unit of management, with sizable savings.

It is, therefore, a mistake to think that electronic data processing equipment has outmoded or eliminated these other related functional devices. That mistake is the same as the mistake of thinking that the cerebrum has made the primitive medulla and old cerebellum superfluous. Those ancient organs are still taking care of the business of routine living and doing a better job than we could possibly do if we had consciously to program each heartbeat and each step.

The business counterpart of the central nervous system which in man deals with conscious activities — reasoning, planning, and executing puposeful complex actions—is the highly sophisticated, integrated data processing equipment and techniques that have recently been developed. These are the things that are giving us the power to deal with the increasing complexities of Centralized Control of Decentralized Operations. It is perfectly true, of course, that there are companies that can keep a UNIVAC System, or other high speed, large scale digital computer, loaded with some intrinsically simple job such as payroll, public utility billing, or premium accounting—and save a lot of money.

The real utility and the great value of these Electronic Data Processing Systems lies in their combination of great versatility and incredible speeds. This combination of speed and versatility opens a whole new area of control. A single datum which can be anything from a single character to several computer words in length, can be written once on magnetic tape. It can then be handled again and again—added, subtracted, multiplied, divided, compared, merged, abstracted or modified—for many purposes. Let us consider again a sales order. It can be given a numeric customer designation for convenience and brevity. Then, *with proper programming*, it can be used to all the things that have to be done with it in the ordinary course of business, such as filling it, shipping it, billing it, and handling the payment for it. It can also be distributed line by line to reduce inventory, to set in motion a new production order, to explode a bill of material, and to furnish data that eventually will lead to releases of purchase orders and creation of accounts payable. With a computer properly *programmed* all these things become automatic.

I have used the word "*programming*" several times and an explanation is in order. This is a technique in instructing an Electronic Data Processing System so as to maximize its productive possibilities. In many respects, programming might be considered a method of "work simplification" and/or "work measurement" to assure the attainment of the most desirable operating objectives. In many cases the programming of a computer application has revealed "unusual" work simplification possibilities previously overlooked and that could be incorporated in the present system.

ELECTRONIC Data Automation Systems provide what amount to new instruments of control, for they are foolproof and automatic. Aside from putting tapes on and taking them off the servo-mechanisms of the computer they require practically no human intervention to give people action-facts. If the computer is properly scheduled and programmed, all the information needed comes quickly, and accurately, to the people who need it to control detailed operations. If such factual data is then used to prevent overstocks, understocks, broken delivery promises, materials shortages, past due receivables, failures to discount payables, and the like, management does not have to devote time to correcting mistakes that should not have occurred but that do happen.

This is a very elementary gain from the use of Electronic Data Processing Equipment. It is only one step in the multiple use of input data, instead of the repeated single use of significant data, department by department, plant by plant, with final consolidation in a corporate statement. This gain results from two factors: (1) electronic circuits are vastly faster than human nervous systems and (2) the gates in these cor-

cuits work when they are told to do so, whereas human synapses are undependable. There is no question that when there is enough volume of simple data it pays to use electronic data processing equipment for either single purpose or related multiple purpose repetitive jobs. Efficient control means using appropriate instrumentation for each job to be done, with the free flow of information and feedbacks among related jobs. Total net cost and time availability determine what is best.

Experience indicates that electronic data processing equipment has created new powers of Control of Decentralized Operations. What it has really made possible is the analysis of meaningful relationships in detail. Here is a concrete example. Efficient sales managers for many years have maintained visible sales control records with signal control. These records included either all accounts or all accounts and prospects. Such vital administrative records were, are and will continue to be extremely valuable for the control and field supervision of day to day activities of salesmen. Conscientious and figure-minded sales managers tried to analyze such records, recognizing that such analysis is useful.

SUCH attempts were usually successful with respect to individual accounts and, in a limited degree, with individual salesmen. They broke down completely when the attempt was made to extract important relationships among numerous independent variables — size of establishment, industrial classification, products produced, pattern of calls, pattern of promotion, location, strengths and weaknesses of covering salesman, and the like.

Electronic data processing equipment has changed this situation. Now the same data used to feed the visible sales control record — invoices, call reports, lost order reports, basic situation reports, direct mail release reports, etc.,— are fed into the circuitry of a computer where they produce the posting medium for the sales control record (plus data for many other purposes). Then, accumulating on tape for a significant period, they can be used for statistical analysis that shows clearly such important, and hitherto virtually unavailable information as:

1. Characteristics of profitable accounts;
2. Stigmata of unprofitable accounts;
3. Potential worth of prospects, when and if sold;
4. Efficient call patterns for converting prospects;
5. Efficient call patterns for retaining profitable accounts;
6. Strengths and weaknesses of individual salesmen;
7. Penetration of market segments as a function of effort; and
8. Saturation and retention of accounts.

With a comprehensive analysis that covers these and related areas plus the fruits of territorial market measurements that now take hours instead of weeks for arithmetical calculations, plus reliable sales forecasts; plus other market research information—a sales manager does not have to be a wizard to know, and know that he knows how many salesmen he needs, where he needs them, how many of what kinds of prospects and customers they should cultivate, how often they should call, and what strategy and tactics they should use. What is more, he knows from his up-to-date visible sales control system—accurately and currently, thanks to electronic data processing of daily reports—how much progress is being made in relation to opportunity, so that through his supervisors he can take corrective action where and when it is needed.

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more critical—for management must communicate its real needs and requirements to the equipment and the reduced data must be fed back in language that management can quickly understand and act upon. To me, this simply means that we who are in management must become more and more the coordinators of specialists—mathematicians, statisticians, market research men, quality control men, engineers, cost accountants, and all the rest. We must provide clear communications channels and free flows of relevant data, and we must, above all, acquaint ourselves with the limitations of our specialists as well as with their general skills.

Such technological developments account for the increasing number of Operations Research groups in large organizations, and their interest in integrated data processing as the means through which we can get, and keep control of, an increasingly complex decentralized operation—in an increasingly competitive economy in which cost rigidities are increasing. But integrated data processing is not just a phase or a magical charm that we can invoke. It does not begin and end with feeding tape into electronic equipment and watching tables of results pour out. The man or firm that lets it degenerate into any such thing will get the expense but not the benefit.

INTEGRATED data processing is effective only when it is an integration at all levels among management — line, staff, and machines — that makes into a cohesive whole the objectives of management, the capabilities of operating people, the special knowledge of staff, and the tremendous speeds and versatilities of electronic data processing equipment; with clear and open communication and feedback of all relevant data from the market and from the production and distribution facilities.

The foregoing concept likewise indicates the desirability of removing many of the departmental barriers that have developed as a result of slow, inadequate inter-departmental communications on economic problems that relate to the success of the overall operation.

The whole purpose of *phased control* is to insure effective action in relation to opportunities. Therefore, the organization must be such that purposeful and appropriate action becomes possible. That, and not the selection of this or that piece of equipment, is the important thing. I think we can agree that under the conditions that now exist—and are likely to continue for the foreseeable future—we can do no better than to continue the general scheme of maintaining a functional separation of line and staff, reporting to senior management with clear communications up and down through manageable spans of control.

There are a number of ways in which this can be achieved. Sylvania Electric, in the formal opening of its Data Processing Center on June 27, 1956, made the following comments in a dedication folder, *A New Concept in Administrative Automation*:

Sylvania's new Data Processing Center at Camillus, New York, near Syracuse, stands on a hilltop that, symbolically. once served Algonquin Indians as a lookout and communications post. Today, the Center is the lookout post and communications center for a nationwide company—the focal point of an 18,000 mile communications network linking Sylvania operations throughout the nation to a complex computing system.

In this revolutionary application of automation and electronics to industry, 61 cities in 20 states are only seconds away from the Center. A continuing flow of information from 45 Sylvania plants, 19 laboratories, 10 division headquarters, the corporate executive offices, 27 sales offices and 17 warehouses pours into the Center for summarization and processing.

Out of this new concept of administrative automation comes the data needed for faster more effective decision-making and action on the part of Sylvania management at all levels.

Basic to the concept of the Data Processing System is the fact that highly competitive conditions, steadily broadening markets, and rapid technological change necessitate rapid consolidation of operating information.

In modern business, there is less and less time between the events upon which management must base necessary decisions. So the Data Processing System was evolved as a means of providing all levels of management with complete and significant information as soon as possible.

Here are some examples of what the Data Processing System can accomplish: A complete payroll, including preparation of checks, can be processed in a few hours, instead of several days. Information can be gathered from the field and a valuable market research program devised in a day or so—a task which previously might have taken weeks. Engineers can calculate complex technical problems in a few minutes instead of several days. The system will gear production to inventory by providing virtually instantaneous knowledge of the Company's exact inventory of any product. The system makes possible accumulation of extensive additional information on all phases of company operations and competitive markets, which high costs previously made impractical.

A major objective in Sylvania's plan for the system is to provide complete accounting and statistical services to all 10 operating divisions. This will involve putting into the "Univac" computer all of the many statistical reports now being used for management control in the divisions. From this will come, for example, sales forecast information, and decisive data for market research and production planning. The Center is expected to make major contributions in other major areas, including research and development, engineering, finance, performance measurement, personnel administration.

This is undoubtedly a wonderful plan for Sylvania Electric Products and one that holds a good deal of promise for many others. However, other companies have adopted other solutions, with semi-decentralized computers on a regional basis, using many combinations of skills and equipment, and passing upward only what needs control and decision at each higher level of executive control. As in many things, situations and circumstances alter cases, and I think he would be a rash man who proclaimed that there is one and only one correct solution that should be used universally.

To sum up: We are dealing with a relatively new problem in this matter of Centralized Control of Decentralized Operations. The problem, as I see it, can be solved, and it will be solved by intelligent use of available tools. The problem can be broken down into one of reconciling the needs of communications, and feedbacks to the requirements of manageable spans of control. Along with these things, we have a growing population and a political disposition to keep increasing the money supply to insure full employment and increasing prices regardless of the fate of people on fixed incomes.

However, in the existence of the tested methods of organization into line and staff—coordinated by senior management — and with the availability of electronic data processing equipment, we can look forward confidently to increasingly effective ways of controlling large scale operations regardless of the form or organization and the degree of decentralization.

CONSIDERING this as a progress report, I would be remiss if I did not emphasize that this is only the beginning of new challenges in the field of management sciences. Creative thinking is surely the order of the day, and I want to conclude by reading you the introduction of Dr. Herb True (Assistant Dean of Marketing at Notre Dame University) in his dissertation on *Creativity*:

Nothing is done. Everything in the world remains to be done, or done over. The greatest picture isn't painted. The ideal labor contract is not yet written. A windproof match, an airtight bottle cap, a lifetime lead pencil are all yet to be conceived. The best way to train salesmen, an easy way to keep slim, a better way to pin diapers, anything to prevent baldness—all of these problems are unsolved.

(Continued on page 30)

Arbitration-Grievance Index As A Managerial Control

by Willard A. Lewis

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THE INDUSTRIAL RELATIONS EXECUTIVE, along with personnel administration technicians generally, have become more and more concerned with how to evaluate and how to report in tangible form the results of their policies and practices as an aid in management decision-making. This reflects both the growing professional interest in developing methods for measuring the state of employee relations, employee morale, employee productivity, and the need for the Industrial Relations Executive to justify his function on the corporate budget line. In the language of modern management, the need is one of developing a managerial control that will appraise the performance of the Industrial Relations Department and the execution of corporate policy and decisions in this area, and a control which will correct deviations from the established targets and norms. Delegation of authority to the Industrial Relations Executive in labor contract interpretation and application, development of a training program for understanding the labor agreement, for proper grievance prevention and processing and for adequate arbitration are the accepted controls.[1] Yet a simple statistical head-count approach toward grievance and arbitration results is patently inadequate. The subject matters of grievance and arbitral proceedings, enmeshed as they are in "the whole texture of subjective shop relationships",[2] and affected with the behavior patterns of external relations with labor organizations, suggests that the clinical analytic case technique is more rewarding.

Grievance handling, including arbitration as a terminal step, figures significantly in some of the efforts that have been made. At the General Electric Company, the Employee Relations Index (ERI)[3] includes the grievance rate as one of the eight accepted indicators. The ERI, a complex program of applied research, is being installed gradually and cautiously, there having been a sufficient showing of its potential value in tracing employee relations trends, controlling costs, informing management, and generally improving the management process. The Crucible Steel Corporation of America in its Industrial Relations Index[4] project has identified grievances (filed, pending and settled in stages 2 through 4-into-arbitration) along with work stoppages, as the elements of its labor relations monthly measurements. Figures are correlated with other relevant control factors, such as supervisory training. These techniques presumably help management to see how the Industrial Relations Program is achieving its objective. However, "even if the ERI works out well for General

[1] *SEE: Willard A. Lewis,* "Labor Arbitration and the Industrial Relations Executive", PERSONNEL, vol. 33, No. 2 (September, 1956).

[2] *Benjamin N. Selekman,* "Labor Relations and Human Relations", *McGraw-Hill Book Co. Inc., New York,* 1947 *p.* 77.

[3] *Merrihue and Katzell,* "ERI-Yardstick of Employee Relations, *Harvard Business Review, Vol.* 33, *No.* 6 (1955) *p.* 91.

[4] *S. H. French, Jr.,* "Measuring Progress towards Industrial Relations Objectives", *Personnel, (American Management Association), Vol.* 30, *No.* 5 *March* 1954, *pp.* 338 *et seq.*

WILLARD A. LEWIS is on the Panel of the American Arbitration Association and is a Member of the New York Bar. He has authored several articles on labor arbitration in leading professional periodicals. His experience includes service as a Director of Employee Relations for Greer Hydraulics Inc., as a Federal Labor Relations Administrator-Counsel, and as a labor relations counsellor and management consultant. He is a Member of the New York Chapter of the Society for Advancement of Management.

Electric and the techniques have a far-reaching effect on production and job satisfaction for many companies . . . the factors which show a plus or minus for G. E. are not necessarily reflective of the feelings of employees in other organizations."[5] Hence a needed *caveat* must be inserted against Follow-The-Leader Managements which blindly apply formulae without conducting the requisite validity research in advance.

OTHER forms of measurement currently in use are employee relations audits, morale surveys, efficiency ratings, productivity surveys and the use of personnel statistics. Arbitration and grievance dispositions do not appear significantly in many of these yardsticks. The Science Research Associates (Chicago University group) Employee Inventory developed by the employee attitude research group of the Industrial Relations Center at the University of Chicago does not acknowledge any quantitative measure of grievances. It seems, however, to suggest itself as a substitute for, or a supplement to, grievance filing.[6] Nor is there a grievance-arbitration statistic included in the productivity-morale survey at the University of Michigan Survey Research Center.[7] Apart from the validation of such techniques, their findings become more meaningful when set over against the company records in disputes adjustment and settlement. In a sense these tools of personnel and industrial relations management are in competition with the formal grievance-arbitration machinery, the latter having developed as a means of permitting management and the union to live together under their mutual contracts.

In isolating the operation of the grievance and arbitration machinery as an Index of Labor Relations, the Industrial Relations Director must be on guard against the crude tally of the number of grievances filed in his plant, the number of settled grievances, the number of grievances which go to arbitration and finally the number left pending. The labor arbitration cases are themselves of greater significance because normally only the thorniest, most important matters reach the final stage. Even a more refined quantitative breakdown by type, origin or recurrence will not yield a necessarily true picture. Arbitration cases and grievances must be understood in terms of human and inter-personal relations—in qualitative terms. They must also be related to production, sales and company finance where these factors precipitate employee reactions. Lay-offs and reductions in work force which may be dictated by productive needs of the company are almost directly reflected in the rise of the number of grievances, especially those involving seniority rights. Likewise, introduction of production standards or the introduction of new technology may yield an increase in formal complaints. And, in turn, these may lead to an increased case-load of arbitrations. If any Industrial Relations Index or personnel statistic summary is kept, these effects will show up dramatically on the charts and graphs. But it would certainly not mean on its face that bad labor relations were developing. The profit position of the company must be kept uppermost in the minds of the Management Executives and the Industrial Relations Executive in reviewing these matters.[8] It may clearly appear that the production and profit interests of the company's management planning are being best served by a required lay-off or by required introduction of new production or wage methods. The alternatives to increased grievances and increased arbitration, in the considered judgment of management, may well be less costly than the orderly processing of disputes arising out of such necessary management actions. Conversely, a decline in the number of grievances and arbitrations does not necessarily demonstrate a sound management-union relationship. Such a drop in grievances and arbitration might have been made as a result of unwarranted surrender to union claims—a dangerous situation in itself. Or, it might have been achieved by the obtaining of favorable arbitration awards without in any way having reached the underlying human relations or production problems, and thus could well lead to lowered production output and rise in labor and production costs.

Just how does the Index meet the three serious challenges to its effectiveness as a management control: (1) the establishment of norms of performance; (2) the evaluation of grievance dispositions and arbitration awards; (3) the communication of the results to Top Management? A statistical approach based upon the numbers-game of complaints disposed of, resolved, "won" and "lost" is barren. It does not account for direct and tangential benefits or losses to the enterprise. I have participated in resolving grievances in favor of the incumbent Union which, in some instances, have improved quality control in the Shipping Department, in others eliminated wasteful duplication in the Stockrooms, and in still others strengthened the Safety and Accident Program. These have meant dollars and cents advantage to the Corporation, dramatically so in the case of reduced insurance premiums. In wildcat strike situations we know of resort to arbitration by *both* the Management and the Union in order to obtain a desired award which, apart from its surface sanction partly against either or both parties prepares the ground for assurance of undisturbed production. How does the slide-rule interpolate this effect in calculating the Industrial Relations Department's "batting average"? Will a footnote to a monthly Index adequately explain that a rash of current grievances over reclassification is, in fact, a Union effort to beat a Job Evaluation deadline? Will a string of arbitration "victories" tell the true story of a Union, frustrated by Management's failure to sit down with it to discuss plant problems, forcing-on cases untenable on their face? And what of measuring the positive contributions to collective bargaining as a by-product of grievance-processing, regardless of particular case determinations?

THE MOST fruitful use of arbitration and grievance machinery as an index of Labor is had (and these two cannot be separated for this purpose) when the clinical problem-solving approach is taken. Grievances, disputes and arbitration cases should be classified and analyzed in terms of type, place-of-origin within the company, their duration, their recurrence, behavior patterns revealed

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[5] *Matthew Radom,* "Industry's Contribution to Research in Industrial Relations" *Proceedings of Industrial Relations Research Association 8th Annual Meeting,* (*Dec.* 1955) *p.* 100.

[6] *Moore and Burns,* "How Good is Good Morale?", *Factory Management and Maintenance* (*Feb.* 1956) *Vol.* 114, *No.* 2, *pp.* 130-136.

R. K. Burns, "Employee Morale — The Meaning of Measurement", *Proceedings Industrial Relations Research Association 4th Annual Meeting,* (*Dec.* 1951) *p.* 57.

[7] *Kahn and Morse,* "The Relation of Productivity to Morale" *ibid, p.* 69.

[8] *Note the current trend to introduce added managerial responsibilities such as responsibility to employees and their dependents, responsibility to the community. See: John E. Gagnon,* "Factors in Industrial Relations Prospects", *Monthly Labor Review, Vol.* 79, *No.* 4 (*April* 1956) *at p.* 416.

For a counter statement of union objectives, see: Solomon Burkin, "A Trade Unionist Appraises Management Personnel Philosophy. *Harvard Business Review vol.* 38, *No.* 5 (*Sept.* 1950) *pp.* 59-64.

the principles involved, political implications, the efforts directed at settlement and the attitudes of the parties. As a result, the Industrial Relations Executive should be able to spot the areas in which the company's operations need correction, where it would be strengthened by increased supervisory training programs, or by realignment of production departments. Perhaps, on balance, the situation requires calling in the Union for negotiation of important policy and contract changes without waiting for the periodic bargaining crisis to come around. Thus "a more permanent result is achieved when the Industrial Relations Executive translates labor arbitration awards first into collective bargaining proposals, and then into contract modifications."[9]

To be sure, the Industrial Relations Executive will have to educate his top management in these matters. It is acknowledged that creating a better understanding between himself and upper management remains his most perplexing problem.[10] Reading a report on arbitration and grievance handling is not going to carry with it the clarity that management executives are accustomed to in their reading of sales figures, production schedules or orders booked. The Industrial Relations Director is on his own when it comes to explaining that when an arbitration award is adverse to the company it should not be counted as though it were part of a baseball box score. In the complex area of labor relations imagined individual grievances, internal union politics, and external corporate finances compete for attention with those variables recognized by students of personnel administration. An arbitration award, for example, reinstating a discharged shop steward, but without back pay, may be a happier and less expensive answer than if the company had been able to sustain its original action. Penalizing a shop steward through loss of back pay is not an easy accomplishment in the light of the privileges surrounding union representatives in most union contracts. Or, in a wholly different situation, an arbitrator may find against the company by ruling that there was a failure to follow strict seniority in promoting an employee, and yet his opinion may establish for the first time the company's right to hold written promotional examinations.[11] It is the Industrial Relations Executive's public relations job to educate Upper, Middle, and Lower Management in these matters, including the need at the time to take affirmative action even though such action may lead to an apparently adverse award.

There is one common language of communication for policy-making management and for operating management of which the Industrial Relations Executive can avail himself, and that is the language of cost which figures so prominently in the realm of decision-making. He must weight the Index to allow for: 1) direct costs of grievance dispositions and arbitration awards such as back-pay penalties which have either been levied or avoided; 2) indirect costs resulting from non-productive time spent by employee-members of the work force and by management representatives; 3) fixed and variable costs or savings to the enterprise flowing from effects of particular grievance-arbitration dispositions. Indeed, it is the opinion of one author that "Labor Relations are good insofar as they are contributing to the minimization of, first, unit labor costs, and second, unit production costs. And conversely, Labor Relations are bad (regardless of how happy the employees may be) insofar as they are contributing to an increase in such costs."[12]

A picture of the health of the company's labor relations, vis-a-vis the company and its employees-as-employees, where for one reason or another they are not adequately represented by the duly designated collective bargaining agent. The only fair conclusion would appear to be that if the Industrial Relations Executive must fashion an Index, (1) each Index must be hand-tailored to reflect, qualitatively, the particular company situation and (2) each Index must be evaluated within the context of other relevant factors and correlated with other indices of company operations—with other managerial controls. And, within its own framework, each Index must clearly anchor itself to the Company standard of sound labor relations, it must permit adequate arbitration-grievance evaluation, and it must be self-explanatory to Top Management. Only then will the Arbitration-Grievance Index serve as a meaningful tool in the repertory of the personnel administrator. And only then will the Industrial Relations Executive have acquired data reasonably approximating the quality needed to justify the ever-widening "slices of decision-making authority" which are finding their way into his operational orbit, as confirmed by current studies[13] and by the experience of those of us who have held such a post.

Moreover, if the Index honestly and fairly reflects the Union position on the various issues grieved and arbitrated, and if, where proper, credits the Union and the grievants with their deserved measure of constructive participation, it can serve also to win respect for and confidence in the fairness of Management in its employee relations dealings. ■

[9] *Willard A. Lewis, "Labor Arbitration and the Industrial Relations Executive", supra, footnote 1.*

[10] *D. E. McFarland, "Dilemma of the Industrial Relations Director", Harvard Business Review, Vol. 32, No. 4 (1954), pp. 123 et seq.*

[11] *In re Stauffer Chemical Company, Inc., 8 Labor Arbitration 278 (Bureau of National Affairs).*

[12] *S. Herbert Unterberger, "Grievances — An Index of Labor Relations", Proceedings of the 7th Annual Conference, Society for Advancement of Management, Philadelphia Chapter, (1955), p. 58.*

[13] *Myers and Turnbull, "Line and Staff in Industrial Relations", Harvard Business Review, Vol. 34, No. 4 (1956) pp. 113 et seq.*

Fred E. Harrell

New S.A.M. National Officers

Warren J. King

NEW S.A.M. National Officers are **Fred E. Harrell**, elected Treasurer, replacing **Bruno Moski**, and **Warren J. King**, appointed Vice President of Material Handling, replacing **W. J. Puder.**

Mr. Harrell, General Manager of the Marquette Division of Curtiss-Wright Corporation, is a member of the Cleveland Chapter of S.A.M., where he has served five years on the Board of Directors and two years as National Director. He has also been a Vice President of the Central Region of S.A.M.

Mr. King is Associate Editor of McGraw-Hill Publishing Company's FACTORY Management and Maintenance magazine, a member of the New York S.A.M. Chapter, and an officer of the Industrial Management Society.

Capital Expenditure Analysis Procedure

by David R. Platt
Purchase Analyst
Ford Division
Ford Motor Company
Detroit

THE PURPOSE of this procedure is to provide a standard means of evaluating and presenting quantitative factors when considering capital expenditures. Proper use of this procedure will provide a quide in choosing between various competing alternatives in order to keep Company return on invested capital at the maximum.

The method of analysis is based on the concept of Present Value of money. This time-value concept of money stems from the fact that money received (or saved) today is more valuable than money received (or saved) in the future. For example, if 40¢ is invested today at a 20% interest rate compounded annually, it will be worth $1.00 in five years—or conversely, $1.00 received five years hence discounted at the same compounded 20% interest rate has a Present Value of 40¢ today. Discount factors at various interest rates for money received (or saved) in future years are easily computed mathematically as is discussed at a later point.

In order to better understand how a rate of return can be earned on and measured for a capital expenditure in a proposed alternative, it is sometimes helpful to view the Investment (expenditure) as a mortgage held by the Company. The monthly payment to the Company in the form of incremental Profits Increase consist of principal reduction plus interest charged for use of the money. The interest portion of this monthly payment (Profits Increase) is the rate of return to be realized on the Investment. When the cumulative value of these payments, discounted at the interest rate desired, equals the expenditure (mortgage held), it means that the principal has been repaid plus the interest desired on the particular Investment Considered. To find discount factors to apply to such incremental Profit Increases is simply a matter of substituting interest rates and years in proper annuity formulae geared to the rate of money inflow assumed.

For purposes of this procedure, it is assumed that future money inflow is to be received once per year in some given situations and once per month in other given situations. The discount factors listed on Table A have been prepared for use when it is assumed money is to be received yearly at each year's end. The cumulative discount factors listed on Table B have been prepared for use when it is assumed money is to be received uniformly at each month's end. In both Tables, interest is compounded annually.

Table A should be used when it is desired to know the Present Value of a single payment received at the end of any year at various interest rates. Its use in this procedure is limited to adjusting (when necessary) Net Investment Considered (Exhibit IV).

Table B should be used when it is desired to know the cumulative Present Value of a uniform monthly money inflow received for a specific number of years at various interest rates. Discount factors from this table are used on Exhibit II-b and are found by computing the incremental additions which make up the cumulative discount factors listed.

Another valuable use for Table B is found when it is desired to know the amount of uniform annual Profits Increase necessary for a given dollar Investment to yield a desired rate of return. This is done as follows:

DAVID R. PLATT left the Pennsylvania State University in 1950 with a B.A. and joined General Motors Corporation's Ternstedt Division as a trainee. He moved to the New Holland Division of Sperry Rand Corporation as a Student Engineer in 1951, continued as Foreman, then Senior Process Engineer until April 1956 when he joined the Ford Motor Company in his present position. In 1955 Mr. Platt received an MBA from Harvard Business School. He is a member of the Society for Advancement of Management.

1. Select the number of years uniform money inflow is expected to continue.
2. Follow year chosen line to desired rate of return column.
3. Use the number found in this percentage return column for dividing into the dollar Investment Considered. The result is the annual Profits Increase required for the desired percentage return at a uniform monthly rate of money inflow.

Definition of Terms

1. *Profits Increase*: that sum of money generated by a reduction of continuing out-of-pocket cash costs, or by an increase in sales revenue, through investment in a chosen alternative. Only future cash costs or future incremental profits from additional sales revenue that will be different between alternatives need be considered.
2. *Net Investment Considered*: that expenditure required in "one-shot" adjusted (when necessary) for liquidation value of old equipment, uneven equipment lives, or salvage value of new equipment.
3. *Payback Years*: that number of years required for future money inflow to recover the initial Investment dollars. This time in years is a measure of dollar liquidity and as such is of limited practical value in judging capital expenditures.
4. *Present Value Rate of Return*: that percentage rate of return realized after recovery of initial Investment dollars considering the economic life of the Investment. This percentage rate is a measure of dollar productivity and as such is a sound common basis for the comparison of various competing alternatives.

General Comment—For purposes of quantitative evaluation of capital expenditures, two factors are of prime importance. They are: 1. Profits Increase (or PI); and 2. Net Investment Considered (or NI). Knowing PI and NI, Payback Years to show dollar liquidity, and Present Value rate of return to show dollar productivity, can be found. A standard way for determining and presenting both PI and NI is discussed; as is the use of these figures in computing Payback Years and Present Value rate of return on Investment.

TABLE A

PRESENT VALUE OF $1.00 RECEIVED AT N YEARS END

Discount Factor = $\frac{1}{(1+i)^n}$ where i = interest, n = years

years hence	1.0%	3.0%	4.0%	5.0%	6.0%	8.0%	10.0%	12.5%	15.0%	17.5%	20.0%	25.0%	30.0%	35.0%	40.0%	50.0%
1	.990	.971	.962	.952	.943	.926	.909	889	.870	.851	.833	.800	.769	.741	.714	.667
2	.980	.943	.925	.907	.890	.857	.826	790	.756	.724	.694	.640	.592	.510	.510	.444
3	.971	.915	.889	.864	.840	.794	.751	.702	.658	.616	.579	.512	.455	.406	.364	.296
4	.961	.888	.855	.823	.792	.735	.683	.624	.572	.525	.482	.410	.350	.301	.260	.197
5	.951	.863	.822	.784	.747	.681	.621	.555	.497	.446	.402	.328	.269	.223	.186	.132
6	.942	.837	.790	.746	.705	.630	.564	.493	.432	.380	.335	.262	.207	.165	.133	.088
7	.933	.813	.760	.711	.665	.584	.513	.438	.376	.323	.279	.210	.159	.122	.095	.059
8	.923	.789	.731	.677	.627	.540	.467	.390	.327	.275	.233	.168	.123	.091	.068	.039
9	.914	.766	.703	.645	.592	.500	.424	.346	.284	.234	.194	.134	.094	.067	.048	.026
10	.905	.744	.676	.614	.558	.463	.386	.308	.247	.199	.162	.107	.073	.050	.035	.017
11	.896	.722	.650	.585	.527	.429	.351	.274	.215	.170	.135	.086	.056	.037	.025	.012
12	.887	.701	.625	.557	.497	.397	.319	.243	.187	.144	.112	.069	.043	.027	.018	.008
13	.879	.681	.601	.530	.469	.368	.290	.216	.163	.123	.093	.055	.033	.020	.013	.005
14	.870	.661	.577	.505	.442	.340	.263	.192	.141	.105	.078	.044	.025	.015	.009	.003
15	.861	.642	.555	.481	.417	.315	.239	.170	.123	.089	.065	.035	.020	.011	.006	.002
16	.853	.623	.534	.458	.394	.292	.218	.152	.107	.076	.054	.028	.015	.008	.005	.002
17	.844	.605	.513	.436	.371	.270	.198	.135	.093	.064	.045	.023	.012	.006	.003	.001
18	.836	.587	.494	.416	.350	.250	.180	.120	.081	.055	.038	.018	.009	.005	.002	.001
19	.828	.570	.475	.396	.331	.232	.164	.107	.070	.047	.031	.014	.007	.003	.002	
20	.820	.554	.456	.377	.312	.215	.149	.095	.061	.040	.026	.012	.005	.002	.001	

TABLE B

PRESENT VALUE OF $1/12 RECEIVED MONTHLY FOR N YEARS

Cumulative Discount Factor = $\frac{1-(1+i)^{-n}}{12\left[(1+i)^{1/12}-1\right]}$ where i = interest, n = years

Years of Life	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%
1	0.995	0.989	0.979	0.969	0.959	0.950	0.941	0.932	0.928	0.924	0.915
2	1.979	1.959	1.920	1.883	1.848	1.814	1.781	1.750	1.735	1.720	1.691
3	2.954	2.910	2.826	2.746	2.670	2.599	2.531	2.467	2.436	2.406	2.348
4	3.920	3.843	3.696	3.559	3.432	3.313	3.201	3.096	3.046	2.998	2.905
5	4.876	4.757	4.533	4.327	4.137	3.962	3.799	3.648	3.577	3.508	3.377
6	5.822	5.653	5.338	5.051	4.790	4.551	4.333	4.132	4.038	3.948	3.778
7	6.759	6.531	6.111	5.734	5.395	5.088	4.810	4.557	4.439	4.327	4.117
8	7.687	7.392	6.855	6.379	5.954	5.575	5.235	4.929	4.788	4.654	4.404
9	8.605	8.237	7.571	6.987	6.473	6.018	5.615	5.256	5.091	4.935	4.647
10	9.515	9.085	8.259	7.560	6.953	6.421	5.955	5.543	5.355	5.178	4.854
11	10.415	9.876	8.920	8.101	7.397	6.788	6.258	5.794	5.584	5.388	5.029
12	11.307	10.672	9.556	8.612	7.809	7.121	6.528	6.015	5.784	5.568	5.177
13	12.189	11.452	10.167	9.094	8.190	7.423	6.770	6.208	5.957	5.724	5.302
14	13.063	12.217	10.755	9.548	8.542	7.699	6.985	6.378	6.108	5.858	5.409
15	13.928	12.967	11.321	9.977	6.869	7.949	7.176	6.527	6.239	5.973	5.496
16	14.785	13.702	11.864	10.381	9.171	8.176	7.350	6.658	6.353	6.073	5.576
17	15.633	14.422	12.387	10.762	9.451	8.383	7.503	6.772	6.452	6.159	5.640
18	16.473	15.129	12.890	11.122	9.711	8.571	7.640	6.873	6.539	6.233	5.695
19	17.305	15.822	13.373	11.462	9.951	8.742	7.763	6.961	6.614	6.297	5.742
20	18.128	16.501	13.838	11.782	10.173	8.897	7.872	7.038	6.679	6.352	5.781

Continued

Years of Life	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1	0.907	0.899	0.892	0.888	0.884	0.877	0.870	0.853	0.837	0.822	0.808
2	1.663	1.637	1.611	1.598	1.586	1.562	1.539	1.485	1.435	1.390	1.347
3	2.293	2.241	2.191	2.167	2.143	2.098	2.054	1.953	1.863	1.781	1.706
4	2.818	2.736	2.658	2.621	2.585	2.516	2.450	2.300	2.168	2.050	1.946
5	3.256	3.142	3.036	2.985	2.936	2.842	2.755	2.557	2.386	2.236	2.106
6	3.620	3.475	3.340	3.276	3.214	3.098	2.989	2.747	2.541	2.365	2.212
7	3.924	3.748	3.585	3.509	3.435	3.297	3.169	2.888	2.653	2.453	2.283
8	4.177	3.971	3.783	3.695	3.611	3.453	3.308	2.992	2.732	2.514	2.330
9	4.388	4.154	3.942	3.844	3.750	3.575	3.414	3.070	2.789	2.556	2.362
10	4.564	4.305	4.071	3.963	3.860	3.670	3.497	3.127	2.829	2.585	2.383
11	4.711	4.428	4.175	4.058	3.948	3.744	3.560	3.169	2.858	2.605	2.397
12	4.833	4.529	4.259	4.135	4.018	3.802	3.608	3.201	2.879	2.619	2.406
13	4.935	4.611	4.326	4.196	4.073	3.847	3.646	3.224	2.894	2.629	2.412
14	5.019	4.679	4.380	4.245	4.117	3.883	3.674	3.241	2.904	2.635	2.417
15	5.090	4.735	4.424	4.284	4.152	3.911	3.696	3.254	2.912	2.640	2.419
16	5.149	4.780	4.460	4.315	4.179	3.932	3.713	3.264	2.917	2.643	2.421
17	5.198	4.818	4.488	4.340	4.201	3.949	3.726	3.271	2.921	2.645	2.422
18	5.239	4.848	4.511	4.360	4.218	3.962	3.736	3.276	2.924	2.647	2.423
19	5.273	4.873	4.530	4.376	4.232	3.973	3.744	3.280	2.926	2.648	2.424
20	5.301	4.894	4.545	4.389	4.243	3.981	3.750	3.283	2.927	2.648	2.424

Profits Increase Calculation—Profits Increase resulting from annual operating savings can be computed by use of facts, imagination, and foresight. Only future out-of-pocket costs that will be affected are significant and need to be analyzed. A form (Exhibit III) has been designed for convenience and standardization of presentation. Detailed explanation of the form follows the Exhibit.

Profits Increase from incremental profits resulting from added sales revenue is not thoroughly discussed in this procedure as to manner of calculation. It is a situation which is unusual to most "going-concern" organizations. When it is desired to evaluate such a situation, simply calculate the actual profit dollars to be received and insert in line 12 on Exhibit III.

Net Investment Calculation—Net Investment Considered can be computed by use of facts, imagination and foresight. Only "one-shot" expenditures should be included. For example, purchase price of equipment, freight in, and installation cost should be totaled, then adjusted (when necessary) for liquidation value of old equipment, uneven equipment lives between alternatives, or salvage value of new equipment. A form (Exhibit IV) has been designed for convenience and standardization of presentation. Detailed explanation of the form follows the Exhibit.

Payback Calculation—When using this procedure, Payback Years can be found by referring to Exhibit II (a or b) and successively adding column "a" (Annual Savings) until the sum equals the Investment Considered (y). In most situations the annual interest cost is negligible in comparison to the overall picture and can be ignored without significant error. It should be remem-

EXHIBIT II EXPLANATION

In order to reduce all calculations to mechanical operations of simple arithmetic, and to display calculations, a basic form has been prepared. Use of this form with proper factors enables anyone to calculate an accurate percentage return providing instructions are followed.

Exhibit II-a is to be used when Annual Cash Savings after taxes before depreciation are uniform. Factors listed on this form are taken directly from Table B. Instructions listed on this form explain how it is to be used.

Exhibit II-b is to be used when Annual Cash Savings after taxes before depreciation are not uniform. Factors listed on this form are the incremental yearly increases between the cumulative value discount factors listed on Table B. Instructions listed on this form explain how it is to be used.

EXHIBIT I

REQUEST FOR CAPITAL EXPENDITURE

For: .....

.....

By: .....Division

1. Funds Required for Equipment $.....
2. Funds Required for Special Tooling .....
3. Funds Required for .....
4. Funds Required for .....
5. TOTAL FUNDS $.....
6. Net Investment Considered (Exhibit IV) $.....
7. Annual Savings After Taxes Before Depreciation $.....
8. Payback Years After Taxes .....
9. Rate of Return on Investment Considered:

Years Life	Rate of Return
.....	.....
.....	.....
.....	.....

10. Machine Hours Utilization Comment:

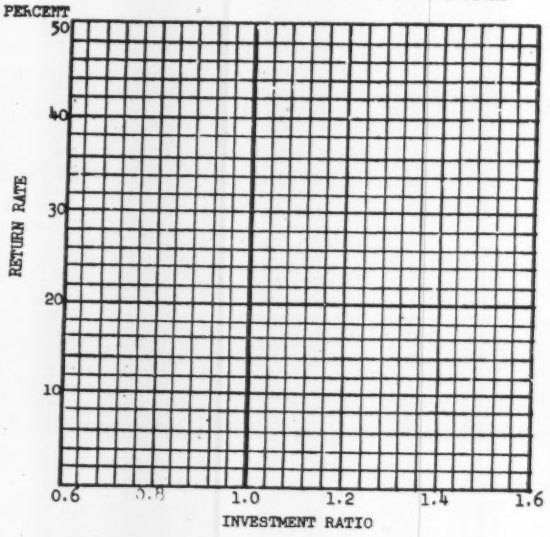
APPROVALS

EXHIBIT I EXPLANATION

This form is a summary form for displaying to management on one sheet information on Exhibits II, III, and IV. It is self-explanatory and does not need detailed instructions.

RATE OF RETURN CALCULATIONS

EXHIBIT II-a



INSTRUCTIONS

Insert ANNUAL SAVINGS from Exhibit III into column (a).

Multiply final year ANNUAL SAVINGS expected by RATE FACTORS for that year.

Insert PRESENT VALUE amounts into TOTALS line.

Insert INVESTMENT considered from Exhibit IV.

Compute INVESTMENT RATIO (x÷y)

Plot INVESTMENT RATIO for each interest RATE column on graph.

Connect points and read RETURN RATE where curve intersects 1.0 RATIO line.

YEARS	0% RATE	10% RATE		20% RATE		30% RATE		40% RATE		50% RATE	
	ANNUAL SAVINGS (a)	FACTOR (b)	PRESENT VALUE (a x b)	FACTOR (c)	PRESENT VALUE (a x c)	FACTOR (d)	PRESENT VALUE (a x d)	FACTOR (e)	PRESENT VALUE (a x e)	FACTOR (f)	PRESENT VALUE (a x f)
1		.950		.907		.870		.837		.808	
2		1.814		1.663		1.539		1.435		1.347	
3		2.599		2.293		2.054		1.863		1.706	
4		3.313		2.818		2.450		2.168		1.946	
5		3.962		3.256		2.755		2.386		2.106	
6		4.551		3.620		2.989		2.541		2.212	
7		5.088		3.924		3.169		2.653		2.283	
8		5.575		4.177		3.308		2.732		2.330	
9		6.018		4.388		3.414		2.789		2.362	
10		6.421		4.564		3.497		2.829		2.383	
11		6.788		4.711		3.560		2.858		2.397	
12		7.121		4.833		3.608		2.879		2.406	
13		7.423		4.935		3.646		2.894		2.412	
14		7.699		5.019		3.674		2.904		2.417	
15		7.949		5.090		3.696		2.912		2.419	
16		8.176		5.149		3.713		2.917		2.421	
17		8.383		5.198		3.726		2.921		2.422	
18		8.571		5.239		3.736		2.924		2.423	
19		8.742		5.273		3.744		2.926		2.424	
20		8.897		5.301		3.750		2.927		2.424	
TOTALS (x)											
INVESTMENT (y)											
RATIO (x ÷ y)											

bered that this time in years is of limited practical value and is simply a measure of dollar liquidity.

Present Value Return Calculation—Percentage return on Investment Considered can easily be computed by use of Exhibits II-a or II-b. Annual Cash Savings after taxes before depreciation (Exhibit III) and Net Investment Considered (Exhibit IV) are simply inserted, following listed instructions, to find the rate of return. Exhibit II-a should be used when annual money inflow is uniform. Exhibit II-b should be used when annual money inflow is not uniform. Both Exhibits have been designed to reduce all calculations to simple arithmetical operations. Detailed explanation of the basic form follows Exhibit II-b.

(*Continued in col. 3, page 24*)

LINES	OUT-OF-POCKET COSTS	YEARS: PRESENT COSTS (a)	FUTURE COSTS (b)	CASH SAVINGS (a - b)	FUTURE COSTS (c)	CASH SAVINGS (a - c)	FUTURE COSTS (d)	CASH SAVINGS (a - d)	FUTURE COSTS (e)	CASH SAVINGS (a - e)	FUTURE COSTS (f)	CASH SAVINGS (a - f)
1	Purchase Cost Plus Freight											
2	Direct Labor Plus Fringe (%)											
3	Indirect Labor Plus Fringe(%)											
4	Raw Materials Plus Freight											
5	Operating Supplies											
6	Maintenance of Equipment											
7	Tool Replacement											
8	Tool Maintenance											
9	Power Consumption											
10	Scrap Loss											
11	Insurance and Property Taxes											
12												
13	TOTALS											
14	TOTAL CASH SAVINGS BEFORE TAXES(Line 13)		$		$		$		$		$	
15	ADD Depreciation Old Equipment											
16	SUB-TOTAL (Line 14 + 15)		$		$		$		$		$	
	LESS:											
17	Depreciation New Equipment	$										
18	Interest Deduction (%)											
19												
20	TOTAL DEDUCTIONS (Line 17 + 18 + 19)		$		$		$		$		$	
21	TAXABLE INCOME INCREASE (Line 16 - 20)		$		$		$		$		$	
22	TAXES TO BE PAID (%) (Line 21 x %)	$										
23	NET ANNUAL SAVINGS AFTER TAXES BEFORE DEPRECIATION (Line 14 - 22)		$		$		$		$		$	

INSTRUCTIONS

Insert PRESENT COSTS and FUTURE COSTS for each year savings is expected.

Total all PRESENT COSTS, FUTURE COSTS and CASH SAVINGS columns.

Subtract column TOTAL for each FUTURE COSTS column from PRESENT COSTS TOTAL and insert CASH SAVINGS into line 14.

Insert necessary information into lines 15 through 22 to find ANNUAL SAVINGS (line 23).

VOLUME CONSIDERED

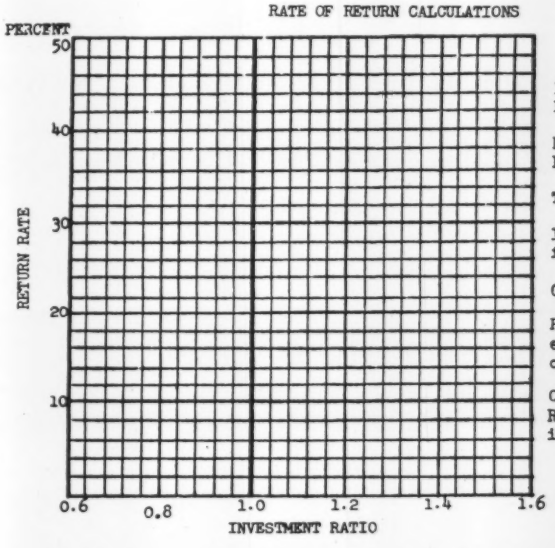
PART NUMBERS CONSIDERED

EXHIBIT III

Net Annual Savings After Taxes Before Depreciation

RATE OF RETURN CALCULATIONS

EXHIBIT II-b



INSTRUCTIONS

Insert ANNUAL SAVINGS from Exhibit III into column (a).

Multiply column (a) by each FACTOR to find PRESENT VALUE.

Total PRESENT VALUE columns.

Insert INVESTMENT considered from Exhibit IV.

Compute INVESTMENT RATIO (x÷y)

Plot INVESTMENT RATIO for each interest RATE column on graph.

Connect points and read RETURN RATE where curve intersects 1.0 RATIO line.

YEARS	0% RATE	10% RATE		20% RATE		30% RATE		40% RATE		50% RATE	
	ANNUAL SAVINGS (a)	FACTOR (b)	PRESENT VALUE (a x b)	FACTOR (c)	PRESENT VALUE (a x c)	FACTOR (d)	PRESENT VALUE (a x d)	FACTOR (e)	PRESENT VALUE (a x e)	FACTOR (f)	PRESENT VALUE (a x f)
1		.950		.907		.870		.837		.808	
2		.864		.756		.669		.598		.539	
3		.785		.630		.515		.428		.359	
4		.714		.525		.396		.305		.240	
5		.649		.438		.305		.218		.160	
6		.589		.364		.234		.155		.106	
7		.537		.304		.180		.112		.071	
8		.487		.253		.139		.079		.047	
9		.443		.211		.106		.057		.032	
10		.403		.176		.083		.040		.021	
11		.367		.147		.063		.029		.014	
12		.333		.122		.048		.021		.009	
13		.302		.102		.038		.015		.006	
14		.276		.084		.028		.010		.004	
15		.250		.071		.022		.008		.002	
16		.227		.059		.017		.005		.002	
17		.207		.049		.013		.004		.001	
18		.188		.041		.010		.003		.001	
19		.171		.034		.008		.002		.001	
20		.155		.028		.006		.001		.000	
TOTAL (x)											
INVESTMENT (y)											
RATIO (x ÷ y)											

EXHIBIT III EXPLANATIONS

This form has been prepared to cover most situations when computing Annual Savings. It must be remembered that future costs and future taxes must be estimated as accurately as possible to insure reliable results. When an alternative chosen would cause a Profits Increase due to added sales revenue, this situation can be covered through use of line 12 by inserting the annual dollar amount expected in the Cash Savings columns. Detailed explanation of each line follows:

Line 1. Purchase cost plus freight in can be secured from the Purchasing Department or from the Accounts Payable Section.

2. Direct labor cost = standard hours required x base rate x 100 (fringe costs percentage). Fringe costs as used here includes overtime pay.
3. Indirect labor cost can be calculated exactly as shown in line 2.
4. Raw materials plus freight in = actual usage x actual cost.
5. Operating supplies cost = actual usage x actual cost.
6. Maintenance of equipment = labor + parts required for repairs.
7. Tool replacement cost = purchase price of expendable tooling.
8. Tool maintenance cost = standard or actual hours required x base rate x 100 (fringe costs percentage).
9. Power consumption cost = kilowatt hours required x rate per kilowatt hour.
10. Scrap loss cost = replacement (or rework) value for parts scrapped.
11. Insurance and property taxes cost to be secured from Insurance and Tax Departments. Dollar amounts involved in most situations are insignificant.
12. Line 12 can be used for any out-of-pocket cost not listed above or for expected Profits Increase due to added sales revenue.
13. Add each column in which figure appear.
14. Insert dollar amount from line 13.
15. Secure depreciation amount on old equipment from cost accounting department and insert.
16. Add lines 14 and 15.
17. Calculate depreciation amount after contacting Cost Accounting Depart-

(EXHIBIT III EXPL. cont.)

ment as to method used for tax purposes.

18. Calculate interest deduction by using depreciable balance of Investment Considered at the beginning of each year x percentage rate.
19. Insert any deductible item not listed.
20. Add lines 17, 18 and 19.
21. Subtract line 20 from line 16.
22. Multiply effective composite rate for (future) state and federal taxes x line 21.
23. Subtract line 22 from line 14.

EXHIBIT IV EXPLANTION

This form has been prepared to calculate and display Net Investment Considered.

Line 1. Equipment price quote from manufacturer will suffice. Amount expensed or capitalized portions can be found by contacting the Cost Accounting Section.
2. Initial tooling price quote from supplier will suffice. Clarification as to how expensed can be found by contacting the Cost Accounting Section.
3. Freight in charges can be secured from the Traffic Section.
4. Installation labor and materials cost can be secured from the Plant Engineering Section.
5. For use when special taxes are in effect. Contact Tax Department for rates.
6. For use when item considered is not listed.
7. Total all columns.
8. Insert total Investment from line 7.
9. Liquidation value of old equipment is important when analyzing new equipment. The market value of the old equipment after removal costs should be inserted in this line. Capital gain or loss on book value, if significant, should be considered. For clarification on this point when it arises, contact the Tax Department.
10. Uneven equipment service lives between alternatives considered can be handled several different ways. It is recommended that only the useful life of old equipment now in use be analyzed. To do this, the Present Value of the proposed machine at the time of old machine discarding should be inserted in this line. Another way to do this is to analyze the life of the new machine and count as a cost of using the old machine, the price of a replacement at the time it is needed. This problem can also be handled by analyzing equal service life time periods.
11. Salvage value of new equipment as a practical matter need not be considered. When short time periods are analyzed it can and should be considered by inserting the present value of the market price after removal costs adjusted for capital gain or loss. However, in most cases injection of this into the analysis will only confuse people and not improve the analysis. It is recommended that only lines 9 and 10 be considered because a company is a "going concern" and is not in the used machinery business. Lines 9 and 11 must never both be included in the same Investment calculation.
12. Subtract lines 9 or 10 (when necessary) from line 8. Ignore line 11 for reasons previously stated and because both lines 9 and 11 should never be included together in the same analysis.

EXHIBIT IV
NET INVESTMENT CONSIDERED

Particulars	Expensed (a)	Capitalized (b)	TOTAL (a + b)
1. Equipment Purchase Cost	$	$	$
2. Initial Tooling Cost			
3. Freight In			
4. Installation Cost			
5. Special Taxes			
6.			
7. TOTALS	$	$	$

8. TOTAL INVESTMENT $.....
Less: (when necessary)
9. Liquidation value of old equipment adjusted for capital gain or loss $.....
10. Adjustment for uneven equipment lives between alternatives on Present Value basis $.....
11. Adjustment for salvage value of new equipment on Present Value basis $.....
12. NET INVESTMENT CONSIDERED $.....

COMMENTS

(*Continued from col. 1, page 23*)

Conclusion

Proper use of the information presented will provide a standard and accurate means of analyzing most capital expenditure proposals. The percentage rate of return found for the alternative finally selected must be high enough to cover the following three factors: 1. Cost of borrowing money; 2. Compensation for risks involved; and, 3. Compensation for problems related to operations. Otherwise, the alternative chosen will not have been selected with profit maximization as the sole goal. In using this procedure to evaluate the relative financial merits of various alternatives, it is essential that sound judgment be used in recognition of short-run and long-run objectives as related to future return on capital invested. ■

S. A. M. Conference PROCEEDINGS

12th Annual S.A.M.-A.S.M.E. MANAGEMENT ENGINEERING Conference		☐ Member: $3.50	☐ Non-member: $5.00
2nd Annual MEASUREMENT OF MANAGEMENT Conference		☐ Member: $3.50	☐ Non-member: $5.00
11th Annual S.A.M.-A.S.M.E. MANAGEMENT ENGINEERING Conference	(April 26-27, 1956)	☐ Member: $3.50	☐ Non-member: $5.00
1st Annual MEASUREMENT OF MANAGEMENT Conference	(November 3-4, 1955)	☐ Member: $3.50	☐ Non-member: $5.00
OPERATIONS RESEARCH Conference	(September 29-30, 1955)	☐ Member: $7.50	☐ Non-member: $10.00
GUARANTEED ANNUAL WAGE CONFERENCE	(March 10-11, 1955)	☐ Member: $5.00	☐ Non-member: $7.50
10th Anniversary TIME STUDY & METHODS Conference	(April 28-29, 1955)	☐ Member: $3.50	☐ Non-member: $5.00

Enclosed find my check ☐ (or) bill me ☐ for the sum of $.....
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SOCIETY FOR ADVANCEMENT OF MANAGEMENT • 74 Fifth Avenue, New York 11, N. Y.

Industrial Know-How Serves Hospitals

by Harold R. Bixler

Executive Vice-President, Society for Advancement of Management, Inc.
New York, N. Y.

TEAMWORK has been an American tradition since our earliest days. It has kept us mobile in the uphill struggle for a better way of life. In countless ways men are cooperating for the benefit of mankind, and one of the most dramatic portrayals of teamwork is taking place today in American hospitals.

Hospital administrators in America are running the nation's fifth largest industry. They are faced with a complex administrative task. The problems are both numerous and diverse. Quite justifiably the pressing demands for improving medical care take precedence over problems concerning the institution's physical plant.

This often results in an accumulation of disturbing conditions which require the immediate attention of an expert. In the past the cost of hiring an expert with the required technological skills was found, in many instances, to be prohibitive. Then American teamwork came into play. Industry offered to let hospital administrators tap its vast resources of technical know-how. Hospitals throughout the country responded and another stirring chapter on teamwork was written.

The latest techniques of modern American business are channeled to hospitals under the guidance of the Society for Advancement of Management, a professional management group which has 170 chapters throughout the United States. The Society, with the aid of hospital administrators, has organized local groups known as Industry's Advisory Boards for Hospitals. Some 18 advisory boards are now at work in 12 states, and at least 40 others are in the process of being formed in 26 states and Canada.

What each board offers hospitals in its territory are the talents of a group of specialists, each expert in his own field, who come into a hospital, survey trouble spots, diagnose their cause, and make recommendations for their elimination. Such specialists are industrial engineers, personnel directors, public relations counselors, cafeteria managers, accountants, safety experts and others who volunteer their skills through the advisory boards to help a troubled hospital.

For these services, hospitals pay nothing. Industry derives its compensation from the knowledge that it is performing for the welfare of its employees, and the community as a whole.

The plan to form hospital advisory boards was conceived in 1951 by Gen. Robert Wood Johnson, chairman of the board of Johnson & Johnson. During the formative stages the first board drew its entire support from the Johnson & Johnson family of companies. The boards were hailed as something new in the field of hospital management, and soon proved their value to the community. Hospital administrators who have benefited from the work of an advisory board are unstinting in their praise of the results. Their views are shared too by members of the medical profession who are acutely aware of improved conditions.

Even though the program has grown beyond all expectations, industry still stands ready to serve in any area of the country where its services are requested. The advisory board steadfastly adheres to its advisory role. With all of the resources at its command it tackles an assignment given by an administrator and produces recommendations for improvement. The decision to accept the recommendations rests solely with the administrator. The advisory board's approach to even the most delicate problems is in keeping with the high ethical standards of the hospital.

No problem within the scope of industry's talents is too large for an advisory board, and none too small. Your hospital might be plagued by a noisy lobby; an advisory board sound engineer would make a scientific study. At another institution personnel in the blood bank might be bogged down by paperwork. A board accountant would help untangle the situation. Nurses might be performing menial tasks that reduce the time they devote to patient care. Here again, an expert carefully selected by the board would be called in to make a study.

These are some of the other projects which have been successfully completed by advisory boards:

In an effort to reduce rapid labor turnover, the board recommended and the hospital inaugurated four supervisory training courses for heads of departments and head nurses.

Food service programs were planned in two hospitals which resulted in reduced cost and increased revenue totaling $100,000 a year.

A food preparation project which saved one hospital approximately $50,000 a year.

A noise abatement survey prompted by the complaints of patients, reduced the complaints from 35 to six percent.

Another hospital was able to reduce its personnel by 35 people following a survey aimed at streamlining administrative functions.

A parking lot survey increased the capacity of the same parking area from 45 to 86 cars.

Upon completion of a training course in merit rating, the supervisors of one hospital were able to inaugurate their own merit rating program.

Safety was the chief concern of another institution. The study resulted in a broad safety campaign, including evacuation plans and drills, a hazard check, fire drills and an educational program.

A centralized messenger service program at another hospital greatly reduced the number of errands performed by nurses.

Other advisory board surveys have dealt with purchasing functions, inventory control, warehousing, the laundry, the electrical system and the problems of public relations and dissemination of information to the press, radio and television.

On more than one occasion a hospital administrator has been startled to find the president of a local company hard at work in the hospital making a survey. It is common practice for advisory boards to utilize the services of industrial leaders, as well as their subordinates. Finding the right man for the job is one of the board's key functions.

Because many hospitals share the same problems, the Society for Advancement of Management has worked out a program for distributing the results of hospital surveys. Without referring to the Hospital by name, a case history is written on a particular problem, together with the recommendations of the survey committee. These are distributed to hospital administrators, and often provide sufficient information for a satisfactory solution.

Industry has a certain self-interest in the hospital advisory board program. The safety and security—at times the very lives—of its employees rest with the efficiency of the community hospital. To want to improve hospitals, both for the protection and the morale of its people, is a natural goal. Industry has accepted the challenge and stands ready to serve where needed. Together, hospitals and industry offer another glowing tribute to American teamwork. ■

CIPM Reports . . .

Education for Management Spreads in Latin America and in Europe

EDUCATION by management for management is a concept that was pretty much confined within the borders of the United States until a few years ago. Now, with the strengthening of foreign industrial economies and the growing interest in all phases of management development, management courses in universities, institutes, and associations are being developed in many countries as fast as the nation's experience and finances will permit.

In Chile, as CIPM reported in January, 1957, *Advanced Management*, there will be a second advanced management course in 1957, held under the auspices of CIPM, or CIPM's Chilean counterpart — the Instituto Chileno de Administracion Racional de Empresas—and of the U.S. Government's Technical Assitance Program. Fifty or sixty Chilean executives will gather in Viña del Mar, a Chilean seaside resort, where four U.S. professors of business administration and two U.S. businessmen will give a five-week advanced management course, similar to that initiated there last summer. The leader of the American team is Professor Pearson Hunt of the Harvard Business School, and the other team members include a second representative from Harvard, one from Columbia, and one from Washington University in St. Louis. Herbert Stewart, President of the Reed Manufacturing Company, and Frank Tucker, Director of the Towle Manufacturing Company (both Massachusetts firms) will complete the American team. As an indication of the contagious interest in management development that exists today in Latin America, about ten participants from neighboring countries who have heard of the course and are interested in instituting a similar program in their own countries will attend this summer's session.

In Palermo, Italy, the Italian Productivity Center has been instrumental in the establishment of a Management Training Institute. It is designed to meet the special needs of Southern Italian managers, but is also open to foreign students, with particular registration concessions granted to Greek and Turkish applicants. Several professors from the United States will teach at the Institute in its early years, and they will be assisted by professors from Italian universities and from the Advanced Management Institute in Turin, now in its fourth year of successful operation.

In Lausanne, Switzerland, there is another example of a management education program. It is the Nestle Management Development Institute, founded under the joint sponsorship of the Nestle Company of Switzerland and the University of Lausanne, and patterned on the Aluminum Company of Canada's Management School in Geneva. Leading representatives of Nestle of Switzerland began plans for the Institute two years ago when they first discussed the possibility of starting a middle or advanced management program in Switzerland modeled on the Harvard Business School's Middle and Advanced Management Programs. Much of the organization for the Institute was done by an advisory committee from Harvard, with the financial backing coming from Nestle. The Institute will open its doors in September 1957 to between forty and sixty students from all parts of the world for its first eight-month course. U.S. professors will make up the entire teaching staff, although each professor will have both an American and a European assistant. All courses will be conducted in English, a thorough knowledge of which will be one of the entrance requirements for students, who will be in the 28-38 age group, wtih some managerial experience, and in most cases, with university degrees.

Jane Dustan
CIPM Editor

S.A.M. is a charter member of CIPM, the Council for International Progress in Management, the American non-profit, non-political organization devoted to the practice of scientific management on the international level. CIPM is in turn a member of the international Committee of Scientific Management (CIOS) which represents the organized management societies of twenty-six nations.

CHAPTER MEMBERSHIP STANDINGS

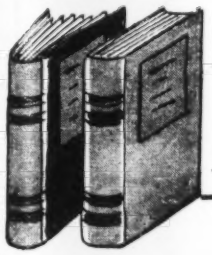
as of September 1, 1957

New York	373	Reading	68
Philadelphia	351	Georgia	67
N. New Jersey	313	Tr. Del. Valley	60
Cincinnati	297	No. Alabama	60
Lancaster	276	Hartford	57
Chicago	268	Richmond	57
Pittsburgh	257	Alabama	55
Cleveland	220	Cent. Penna.	54
Washington	209	Poughkeepsie	54
Detroit	208	Charlotte	53
Milwaukee	193	London, Ont.	53
Boston	191	Twin City	52
San Francisco	172	Clearing	51
Los Angeles	145	Hawaii	50
Indianapolis	138	Lehigh Valley	49
West. No. Car.	123	Mohawk Valley	49
Kansas City	120	Northland	48
Montreal	118	Calumet	47
Dallas	117	Bergen County	45
Binghamton	117	West. Mass.	44
Raritan Valley	111	Cent. New York	44
Providence	111	Westchester	42
Worcester	109	Fox Valley	41
Wilmington	102	Madison	38
Greensboro	101	Nashville	38
Baltimore	100	Athens	34
Hudson Valley	99	No. Miss.	33
Knoxville	98	St. Louis	32
Sacramento	98	Portland	30
New Haven	97	N. E. Penna.	26
Greenville	91	New Orleans	26
San Diego	90	Orange Coast	24
Dayton	80	Louisville	12
Columbus	75	Stamford	11
Bridgeport	74	Non-chapter	52
Long Island	74	Non-resident	82
Puerto Rico	71		

CHAPTER PERFORMANCE AWARDS REPORT

July 31, 1956 to June 30, 1957

Providence	13248	Binghamton	5746
Knoxville	11198	Lehigh Valley	5588
Greenville	10921	Clearing	5501
Washington	10473	Los Angeles	5400
Hudson Val.	10038	Chicago	5380
Milwaukee	8663	No. N. Jersey	5187
Pittsburgh	8561	Richmond	5001
Reading	8528	Tren.-Del. Val.	4960
N. E. Penna.	8301	Charlotte	4913
Kansas City	8234	Detroit	4805
Nashville	8161	Madison	4735
Lancaster	7921	Portland	4247
Greensboro	7906	Sacramento	4117
West. N. Car.	7141	Montreal	4089
Hartford	7110	Worcester	4062
Baltimore	6988	Bridgeport	4041
New Haven	6905	Western Mass.	3450
Wilmington	6383	Dallas	3001
Boston	6316	New Orleans	2166
Twin City	6205	No. Alabama	1853
Cleveland	6194	San Francisco	1839
Raritan Valley	6102	Athens	1484
Alabama	6060	Central Penna.	1400
Georgia	5784	Philadelphia	716



New Management Writing . . .

AUTOMATION IN BUSINESS AND INDUSTRY

By Eugene M. Grabbe, Editor, John Wiley & Sons, New York, 1957. Price $10.00.

TWENTY-ONE authors contribute their special knowledge to make up this text of 596 pages. Initially, the chapters were lectures given for an engineering extension course with the same title in 1955 at the University of California in Los Angeles, San Diego and Berkley.

The nineteen chapters may be roughly grouped into four divisions of (1) fundamentals — five chapters, (2) equipment — five chapters, (3) applications — seven chapters, and (4) future — two chapters.

Running through this book seem to be two main ideas. One is the use of equipment to solve problems in mathematics. The other is to perform repetitive operations. Both, the layman would call "labor saving devices."

Overall is a control called "feedback" that indicates when errors occur and can be made to adjust for them. Errors are relative to the type of system and differ in degree as in any matter of precision.

The important part of problem solving seems to be that of speed. We could get a great many answers to problems involving multi-variables in the time it now takes to get one by manual processes. Such speed can help to overcome the costs of trial and error currently buried in our every-day business decisions.

The chief cost saving phase in actuating repetitive operations appears to be that of reducing mistakes — scrap or rework in manufacturing or errors in clerical operations. We can see how this is brought about by using an oversimplified example. Think back to the days of the player-piano. It would always play exactly the same notes in the same order. If the holes punched in the paper roll were set up to reproduce Yankee Doodle, that is the tune you would get every time.

Like any other "labor saving device," these have their costs. The equipment is expensive. But some authors believe that net savings can be made even with small lot and special production. On the other hand, when you think of the complex factors in many business decisions, electronic equipment costs can be comparatively insignificant. Quick answers to alternative courses of action may make the difference between the success or failure of the enterprise.

Several authors emphasize that the application of automation is not an all or none decision. They point out that we have made partial use of it in many ways for years. They say we will adapt more of it to parts of our operations as wage rates increase.

Frank Shallenberger makes two statements that may help you size up the probable rate of change over. One is that ". . . less than 8 per cent of the work force is employed in industries where automation is technologically or economically practical in the foreseeable future. . . ." The other is that ". . . over 75 per cent of our manufacturing falls in lot sizes of less than fifty pieces."

Of course, there are many operations in the computing, reporting and reproducing fields of office work that are outside his limits. These are the chief applications described. Many started and continue as part of our defense preparations. You will be interested because lots of your tax money has been poured into tinker toys of one kind and another.

The reading is difficult. Much of the writing is in complex engineering terms. Many words appear that most of us do not understand. And you may rebel, as I did, when you read that machines can "remember," "think" and "decide." Silly, of course, but that's the way some of these experts write about their devices.

Business men can understand Chap. 18, Economics of Plant Automation. It is easy reading and may well be worth the price of the book to them. In the main, however, this collection of technical lectures is of vital usefulness, in my opinion, only to those who have a working knowledge of electronics.

Phil Carroll
Professional Engineer
Maplewood, N. J.

PROCUREMENT — Principles and Cases
By Howard T. Lewis and Willard B. England. Published April 1957, by Richard D. Irwin, Inc., Homewood, Illinois. 913 pp; $7.80.

The latest developments and techniques in industrial purchasing. Among the topics covered are: organization of purchasing department; determination and control of quality; procurement procedure; source selection; price policies; procurement of new, used, and leased major equipment; procurement by manufacture; and procurement budgets.

SALES MANAGEMENT (3rd Edition)
By Harold H. Maynard and James H. Davis. Published March 1957, by The Ronald Press Company, 15 East 26th St., New York 10, N. Y. 666 pp; $6.75.

Since the publication of the first edition of this book almost twenty years ago, many changes have occurred in the field of sales management. This third edition recognizes and evaluates these changes and continues to emphasize the developing principles on which soundly conceived policies and procedures are being established. The authors believe that a well-rounded course in sales management must provide students with an opportunity to apply basic principles in the solution of problem situations. Accordingly, they have included many new cases and problems illustrative of situations faced daily by sales administrators, all drawn from the contemporary business scene and designed to develop an analytical approach to problems involving fundamental principles.

EXECUTIVE DECISION MAKING
By Manley Howe Jones. Published March 1957, by Richard D. Irwin, Inc., Homewood, Illinois. 485 pp; $7.20.

The art of decision-making is taught in this book by weaving the practical, common sense ideas that business executives use all the time into an integrated, conceptual framework. The problems faced by executives are: 1) how to make decisions; 2) how to gain acceptance of decisions; and 3) how to plan and put plans into effect. The solutions to these problems are presented so that they may be used to resolve small and large problems with which management must cope.

ENGINEERING ENROLLMENT IN THE UNITED STATES
Edited by Norman N. Barish. Published Spring '57, by New York University Press, Washington Square, New York City. 226 pp.

The purpose of this volume is to present basic statistics on enrollment trends in engineering education in the United States and to suggest some possible interpretations of these trends.
A chapter on engineering education in the USSR has also been included to place the growth of our engineering educational program in clearer perspective. One of the author's principal conclusions in this study is that there is a critical shortage of engineering talent, and he proposes a new pattern of engineering education to meet this shortage.

S.A.M. OCTOBER & NOVEMBER CHAPTER ACTIVITIES

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Alabama	"A Look at Securities"	John O. Eddins	Accounts Executive, Merrill, Pierce, Lynch, Fenner & Beane, Birmingham, Albama		Oct. 8
	"Multiple Management"	P. W. Robson	Plant Mgr., Wolverine Tube-Division of Calumet and Hecla, Inc., Decatur, Alabama		Nov. 12
Binghamton	"Applications of Work Sampling"	John V. Valenteen	Staff Engineer, In charge of Industrial Training, Armstrong Cork Co., Lancaster, Pa.	Carlton Hotel	Oct. 9
Boston	"Use of Research"	Don Malcolm			Oct. 10
	"Creating Effective Change Through Training"	Dr. Gordon L. Lippett			Nov. 14
	"Creative Management"	F. F. Bradshaw	Pres., Richardson, Bellows, Henry, Co.	Carlton Hotel	Nov. 13
Bridgeport	"Why Carry It"	James Brown	Electrolux Corp.	Algonquin Club	Oct. 1
	"Planning For Profits"	Ailen Ottman Guest Chairman—William Haist	Pres., Rochester Mfg. Co.	Algonquin Club	Nov. 5
	Plant Visitation	Chairman—William P. Connors	Edwards Co.	Sikorsky Aircraft, Division United Aircraft Corp.	Nov. 6
Charlotte	Labor Conference (Full day)	Chairman—Fred C. Butler		Hotel Barringer	Oct. 15
	"The Kohler Story" (Dinner Meeting in conj. with Labor Conf.)	L. L. Smith	Vice-Pres., The Kohler Co., Kohler, Wisc.	Hotel Barringer	Oct. 15
	"Profit Sharing & Pension Plan"	J. R. Lincoln	Chairman of the Board, Lincoln Electric Co., Cleveland, Ohio	Hotel Barringer	Nov. 19
Chicago	"How To Obtain Effective Utilization of Cost Accounting Systems"	Vance A. Wadhams	Senior Director of Mgmt. Advisory Services, Price Waterhouse & Co.	Furniture Club of America	Oct. 22
	"How to Improve the Sales Forecasting Program"	G. T. Borcherdt	Marketing Analysis Mgr., E. I. DuPont De Nemours & Co.	Furniture Club of America	Nov. 26
	"Cost Reduction Through Material Handling"	Irving M. Footlik	Pres., Irving M. Footlik & Associates	Furniture Club of America	Oct. 8
	"Organized Labor's Appraisal of Ind. Engineering and Its Effect Upon the Membership's Day to Day Activities"	Daniel J. Healy	Regional Director, AFL-CIO	Furniture Club of America	Nov. 12
	"Management Development Programs—Processes for Identification of Management Potential"	W. A. Krick	General Plant Personnel Supvr., Illinois Bell Telephone Co.	Toffenetti's Restaurant	Oct. 21
	"The Problems of Preparing People for Retirement"	N. S. Booth	Plant Personnel Supv., North Div., Illinois Bell Telephone Co.	Toffenetti's	Nov. 18
	"Cost Reduction Through Production Control"	James Newsome	Production Mgr., Johnson & Johnson	Furniture Club of America	Oct. 17
	"New Opportunities in Production Control"	Workshop Discussion		Furniture Club of America	Nov. 21
	"Use of Queuing Theory in Operations Research Case: Application to Receiving Docks"	Leroy Wickstrom	Oscar Meyer Company	Hardings Presidential Grill	Oct. 1
	"Application of Operations Research Approach to Management Control Programs"	Lyle Fitzgerald	Quaker Oats Company	Hardings Presidential Grill	Nov. 5
Clearing	"The Nature of Executive Ability"	Dr. Roy H. Doty		Clearing Industrial Club	Oct. 16
	"How Does an Executive Age?"	Dr. Ward C. Halstead		Clearing Industrial Club	Nov. 20
Cleveland	"Managing Your Boss"	Brooks Ernest		Cleveland Engineering Society Bldg.	Oct. 14
	"A Filmed Harvard Case Study of Factory Mgmt."	Franklin Foltes		Cleveland Engineering Society Bldg.	Nov. 11
Greensboro	"Making Line and Staff Relationships Effective"	Homer C. Lunken	Natl. Pres., S.A.M.	Starmount Country Club	Oct. 8

S.A.M. OCTOBER & NOVEMBER CHAPTER ACTIVITIES

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
	Plant Visitation			Dixie Furniture Co., Lexington, N. C.	Oct. 15
	"Management Organization"	John B. Joynt	Vice Pres., N. Y. Central Railroad	Starmount Country Club	Nov. 12
Greenville	"Communications"	Charles Kluss	Vice Pres., Champion Paper & Fiber Co., Hamilton, Ohio		Oct. 21
	"American Industry Today"	Harvey N. Collisson	Exec. Vice Pres., Olin Mathieson Chem. Corp.		Nov. 18
Hartford	"Building & Management Team"	Chairman—Philip Watson	American Cyanamid	Bond Hotel	Oct. 17
	"Are Your Promotable"	Gilbert Berry	Dir., Industrial Relations, Royal McBee Corp.	Bond Hotel	Nov. 21
Hudson Valley	"Efficiency, Its Concept and Its Accomplishment"	Frank Federici	Associated Ind. Consultants	Hendrick Hudson Hotel, Troy, N. Y.	Oct. 8
	"Medicine and Management"	Dr. L. Buchanan	Sterling Winthrop Research Lab.	Hendrick Hudson Hotel, Troy, N. Y.	Nov. 12
Kansas City	"Electronic Data Processing"	J. Dollard	Education Mgr., IBM		Oct. 15
	Industrial Engineering Conference				Nov. 15
Knoxville	"Resistance & Righteousness Against Violent Union Tactics"	L. L. Smith	Vice Pres., Kohler Company, Kohler, Wisconsin		Oct. 8
	"Motivation of Employees"	Dr. D. J. Moffie	Haynes Hosiery Mills Co., Winston Salem, N. C.		Nov. 12
Lancaster	"Management and Labor At The Bargaining Table"	G. J. Anyon	Professor of Labor Relations, Aharton School, Univ. of Pa.	Hotel Brunswick	Oct. 22
	"Establishing and Maintaining Line and Staff Relationships"	Homer E. Lunken	Vice Pres., The Lunkenheimer Co., Cincinnati, Ohio and S.A.M. Natl. Pres.	Hotel Yorktowne, York, Pa.	Nov. 19
Lehigh Valley	"Incentive Management"	James F. Lincoln	Lincoln Electric	Walp's Restaurant, Allentown, Pa.	Oct. 8
	"Enthusiasm for Methods Improvement"	John Valenteen	Armstrong Cork Co.	Walp's Restaurant, Allentown, Pa.	Nov. 5
Milwaukee	Annual Conference			Pfister Hotel	Oct. 10
	"Incentives"—Panel Discussion			Engineer's Society Bldg.	Nov. 14
Montreal	"Controlling Labour Costs with Industrial Engineering	R. Noel Bentley	Mgr. of Standards, E. B. Eddy Co.		Oct. 9
	"Management Development"	John B. Joynt	Vice Pres., N. Y. Central Railroad		Nov. 13
Nashville	"Measurement of Maintenance Labor"	John Heritage	Engineering Dept., E. I. DuPont, Wilmington, Del.	Hermitage Hotel	Oct. 14
	"Utilizing the Employees' Ideas"	J. R. Gentry, B. J. Walker	Factory Manager & Labor Relations Mgr., Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.	Hermitage Hotel	Nov. 14
New Haven	"An Appraisal of Management Development Programs"	John P. Foley, Jr.	Pres., J. P. Foley & Co., Inc., Industrial Consulting Psychologists, N. Y.	South Meriden House, Meridan, Conn.	Oct. 24
	"Application of Work Sampling"	John V. Valenteen	Staff Industrial Engineer, Armstrong Cork Company, Lancaster, Pa.	Reilly's Restaurant, Hamden, Conn.	Nov. 21
N. E. Penna.	"Human Motivation for Better Methods"	Jerome Barnum	Jerome Barnum Assoc., Scarsdale, N. Y.	Hotel Sterling, Wilkes-Barre, Penna.	Oct. 7
	"Practical Aspects of a Work Simplification Program"	Walter Hoffman	Work Simplification Director, R. C. A., Harrison, N. J.	Hotel Jermyn, Scranton, Pa.	Nov. 4
North Alabama	"Management Problems Case Histories"	Dr. Lyle D. Worrell	Pres. & Gen. Mgr., Management Services, Inc., Oak Ridge, Tenn.	Hotel Russel Erskine	Oct. 9
	Plant Tour & Business Meeting			Tour—P. R. Mallory, Inc. Huntsville, Ala. Meeting — Hotel Russel Erskine	Nov. 13